Telephony

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A Restatement of Fundamentals

By RANDOLPH EIDE

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IDEAL OF INTEGRITY in management and service to the public pursued throughout the years by the telephone industry. Solution in the past of financial, technical and operating problems inspires confidence in the belief that problems of today will be successfully met. Address before the recent Ohio convention.

AS BUSINESS MEN, interested and responsible for an essential public service, it seemed appropriate for me today to recall to mind some of the fundamentals of a successful telephone industry. It is nearly 60 years since the telephone was invented by Dr. Alexander Graham Bell. During that period an invention regarded by many as a toy and ridiculed by others has grown into an important and successful basic industry.

A service that was thought of as a luxury has been developed until it touches the activities of all business and occupies an essential part in the daily life of the home. Distance, insofar as the spoken word is concerned, has been annihilated. Isolated communities have been placed in a position of rapid spoken communication with all other communities in this country and with a great part of the world. It is now evident that there are no earthly limitations to the distance the human voice can be carried.

Ideal of Integrity in Management and Service

This thing we call the telephone industry did not just happen. It is the result of the energy, foresight, thought, industry, and capital of many thousands of men and women and sometimes of sacrifice on their part.

RANDOLPH EIDE Declared in His Address Before the Ohio Convention That "The Future Will No Doubt See a Much Greater Use of the Telephone Than Exists Today, or Has Ever Existed, and All Problems of Capital Will Be Present."

During this period mistakes have been made. The successes, however, far outweigh the mistakes. Throughout the years the industry by and large has pursued an ideal, an ideal of integrity in management and of service to the public.

The cumulative experience of this successful industry has established fundamental principles to which it must adhere as in the past, if the future service to the public is to continue on a sufficient and an efficient basis. These fundamental principles involve the financing of the business and touch upon the broad relations between workers and management. They are concerned with the quality of service and the charges to the public for that service.

These fundamentals involve the whole system of regulation by public authorities and include the continuous improvement and perfection of the art through research and development. They are bound up in the day-to-day operations of our commercial, plant, traffic, engineering and accounting departments, and have to do with the continuation of the high place the industry occupies in the public esteem.

We are now in the sixth year of a world-wide business upheaval and, as is always the case when the economic and social machines are not running smoothly, many ideas are advanced as to what is wrong and what should be done to get rid of the squeaks, wobbles, and bad parts, whether of fancy or reality.

Along with other businesses, the telephone industry has been charged with sins both of omission and of commission. This is to be expected, as a depression always brings with it a desire on the part of many people—mostly well meaning—to correct speedily the real and imaginary errors of the past, or to make personal capital out of conditions.

In the anxiety that is bound to exist under conditions of distress, many fundamentals are lost sight of in pursuing unworkable theories and attempts are made or actually carried out to substitute statutory laws for economic and natural laws. Economic and natural laws are either

helped or their operations retarded by statutory laws. Statutory laws can never successfully replace our natural and economic laws.

Use Past Experiences As Guide for the Future

It is our duty to approach our new problems with open minds and to seek for our guidance the fund of valuable and successful experiences of the past, as well as profit from any by-gone mistakes or errors of judgment.

When the telephone first came into being it was crude and rather simple, as compared with the modern and intricate system required to furnish the nation-wide and almost world-wide service of today. The principle of the telephone not only had to be created and developed, but its place and essentiality in the business and social world had to be made. This required, among other things, capital and involved the usual risk of loss that accompanies any pioneering venture.

It took men of courage and foresight to hazard funds in that new undertaking. They expected to be succcessful, and they looked forward and were entitled to a financial reward for their risk and effort.

As the public began to realize that a new means of communication was available, demands for service increased rapidly. This involved more capital, constant replacement of existing crude plant and necessitated development and research into new and better ways of carrying on the art.

A fundamental, not only of the telephone business but of all business, was ever apparent in the problems of these telephone pioneers. Capital could not be attracted into the business unless there was a reasonable assurance that it would be rewarded, and certainly not lost or dissipated.

This is true today, even though for the moment we may not be requiring additional capital for the immediate expansion of the business because of the complete cessation or large falling off in the rate of growth.

Financial Safety and Stability Essential to Industry's Success

The future will no doubt see a much greater use of the telephone than exists today, or has ever existed, and all of the problems of capital will be present. The fundamental of financial safety and stability must be present in the industry if it is to carry on successfully and continue to command and be able to attract and pay a return for the capital required.

The financial safety and stability of an institution depend not only on its ability to meet its fixed charges and pay for the hire of capital invested, but involve the financial structure itself. It is fundamental that the capital structure must be represented by property.

Capital, either in the form of stocks or bonds, must be procured at reasonable expense; and it can only be procured in this manner if the business has good management, adequate earnings and a financial structure that is well balanced. Relatively too much bonded indebtedness always presents a difficult situation in times of distress, as the failure to earn interest threatens the property with foreclosure and is likely to move the ownership from the stockholders over to the bondholders.

The telephone experience has indicated that its property should be represented by a relatively small amount of bonded indebtedness, a larger amount of capital stock that represents actual investment in the property, and the accumulation and reinvestment of surpluses and reserves as a cushion against future contingencies. Certainly it has been demstrated that there is no place in the industry for so-called paper, water or write-up stock. It is well established that property and not stock outstanding is the basis of determining the reasonableness of rates.

Basic Principle for Telephone Rates

It is a basic principle in the telephone industry that the lowest possible price for service, consistent with the financial safety of the industry, is for the long run the proper price to charge customers for service. During the past few years many unsupported assertions have been made with respect to the charges for telephone service. These assertions are not new to the business. Generally they are made as a result of a lack of knowledge, because of bias, or by those just naturally against everything. Some assertions with respect to price have their origin in pure selfishness.

In many instances, however, references to rates represent the honest convictions of our average customer, for the reason that he does not have a thorough understanding of the fundamental economics of our industry. He has failed to reason things out, and compares our industry, whose prices are subject to regulation by public authorities, with the general run of other businesses, whose prices move up and down with the cycles of business and whose profits are larger during periods of unusual business activity.

Most of us can look back to a period in the telephone industry when economic considerations in telephone pricing were rather ruthlessly disregarded by many in the industry. I refer to that period following the expiration of the original telephone patents, when there sprang up throughout the country an almost disastrous competition. This resulted in large loss of capital, inadequate and poor service to the public, and misleading and impossible promises of the actual revenues required successfully to meet the responsibility of telephone management in fulfilling its obligation to furnish an important service of high quality for business and social purposes.

Lessons Derived from the Competitive Period

Spurred on by the enthusiasm of promoters, as well as by those who saw a real field for further developing the industry, there came into being a hot race for business with the red apple of service-priced-below-cost being held out to the public for purposes of securing franchises or obtaining subscribers to one or the other of the competitive exchanges. Many failed to perceive the real costs of telephone service; and so long as the plants remained new, imaginary profits were apparent and disbursed accordingly.

That experience emphasized, so far as the telephone industry is concerned, two important points—one, that the telephone industry by its very nature serves the public best with non-competitive local and toll systems; and the other—which is fundamental to all business—that sale of a product or service cannot be successfully carried on unless the price charged for that product or service adequately covers its cost—all of its cost, including the restoral of capital investment consumed in rendering service, and a reward for it commensurate with the risk involved.

For a time during the competitive period many managements thought they were adequately compensated for service, but when maintenance expense, deterioration, inadequacy and obsolescence of plant and equipment set in, they found themselves in serious difficulty, with new capital demands larger than first requirements staring them in the face, credit standing vanished, or vanishing, and under the necessity of increasing the charges for service.

A false idea of the price of good telephone service was carried over

from former days and remains today in the minds of many people. The public demanded the elimination of two telephone systems in any community because of the inconvenience, waste, inferior and partial service, and all of the other unsatisfactory situations born of the competitive period, were not in the best interests of the customers, stockholders, bondholders, employes, management, and the public.

Cheapness Measured by Value; Not by Price

The cheapness of a thing is principally measured by its value, and not by its price. Cheap telephone service of the kind that existed in many places under former rate conditions was not a valuable telephone service. Low-priced telephone service of poor quality is of little value and will not be tolerated by the public.

Since as long ago as the first business transaction or exchange of goods or service between men, there has been a struggle of consumers against producers, and between those who are served and the servers. There should never be any quarrel on the part of the telephone industry, and there is none, with the public desire to be served well, nor with the ambition of the customer to spend as little as possible for that service.

It is reasonable and entirely natural for the public to want both good service and the lowest price. The management of the industry, however, cannot willingly yield to popular clamor or political demands for lower prices for good telephone service, if that lower price in the long run threatens the quality of the service, lowers the living standard and well-being of the employes engaged in the industry, wastes the capital actually invested in the property, or deprives it of its just and reasonable compensation, fails to insure to the user dependable and adequate service and the continuity of it, not only with respect to the present but as regards all future requirements and demands, or, in short, places the existence of the telephone industry in a situation of uncertainty and insecurity. Past experience has demonstrated that the public does not want any one of these things to happen.

Value of Telephone Greatly Exceeds Cost

The cost of telephone service of good quality is an extremely small factor in the budget of an industrial or a commercial concern, and the value of the part that the telephone plays in a business is greatly in excess of its cost.

This same situation is true in the family budget. Good telephone service, even in our large cities, is available at less than the price of a package of good cigarettes per day. Where rates have been lowered with the thought in mind that it would stop disconnects or increase development, experience has shown that the general present level of telephone rates is not a factor controlling loss of telephones.

It became evident more than 30 years ago that competition was not the agency to secure for the American people a universal telephone service at reasonable rates. Competition soon after it started was on the way out, and regulation, particularly of rates, by commissions under statutory control was introduced from time to time as a permanent feature of telephone operation.

MAN'S JOURNEY THROUGH LIFE

Every man is continually engaged in a great journey. He is journeying into a far country, into that country from whence no traveler has returned that we know of; and he is also engaged in a wonderful engineering feat. He is engaged in the engineering feat of building character.—DR. A. E. STRATH-GORDON, before The Executives' Club, Chicago.

Before a fair trial was had of regulation and control, many in the industry regarded the innovation with doubt and forecast serious consequences in its effect on the industry. It must be admitted that proper, fair and impartial regulation in our scheme of government and society, not only is a sensible requirement but is fundamental to the proper conduct of a business such as the telephone industry, which is essentially, though not entirely, non-competitive.

The reason for control and regulation of the telephone industry, however, does not arise alone from lack of competition. Telephone service has grown into such general use and has become so essential a part of the daily social and business lives of our people as to make it necessary to guarantee, through control and regulation, its availability and continuance to the largest number.

Continued progress in the direction of making the telephone available to the largest number and, therefore, of greater social usefulness, may require some changes in our regulatory processes. The present system of regulating telephone rates, for example, presupposes a higher degree of stability than exists in fact. The commendable efforts of the industry to make its service available to as many users as possible has brought risks which prior experience had not made apparent.

Less Rigid Limitation on Return May Be Needed

We find now that in times of depression, which will continue to come periodically, many users greatly curtail their service and many dispense with it altogether. When we consider the inescapable fixed charges and the rather rigid operating expenses inherent in the industry, the question at once arises as to whether sound economics does not require a less rigid limitation of the return to the invested capital. Experience suggests a re-orientation with respect to the problem.

Rate-making is not a judicial problem and should not be approached from a judicial point of view. It is one of business economics, a matter of price-fixing which should be done on the basis of the economic facts involved, and not so much by rigid formulas. The judicial approach to the problem has done much, in my opinion, to bring criticism upon the regulatory system.

Assertions have been made frequently that commission regulation has broken down. Fundamentally there is nothing wrong with governmental control, state or national, of the telephone industry, and, broadly speaking, existing laws when properly administered with the economic factors in mind are sufficient to protect both the public and the industry. Where they are not, I am sure that the telephone industry has no quarrel with their amendment to that end.

Commission's Objective to Protect Both Industry and Public

Commission regulation from its inception and the laws pertaining thereto have had as a proper objective the equal and impartial protection of the public on the one hand and the industry on the other. In order to insure adequate and dependable service at reasonable cost to the consumer, the commission was given jurisdiction and allowed to prescribe, under statutory formula, accounting methods, regulations with respect to conditions of service, finances, prices, and other kindred subjects. Commission control does not carry with it a right to manage the property, nor

"SECOND-MILE" SERVICE

By ANNE BARNES

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A plaintive tune of a popular song keeps running through my mind, "Forget to Remember." As one thought suggests another, I finally decided to write an article about the things we should forget to remember in our work as switchboard operators.

If we would be successful operators—which is only another way of saying, if we would render a pleasing as well as efficient service to our customers—we must *forget to remember* unpleasant contacts over the switchboard. I know, from many years' experience as an operator, that there are some customers you just can't seem to please, and so you decide to give them just what is due them in service and not one whit more. Do you realize that by serving in this way you are not *forgetting to remember* the unpleasant impressions you have formed of such customers?

Away back in the first century a certain wise old man remarked: ". . . Forgetting the things behind, I press forward." Experience had proved to him that it was better to forget to remember things that were behind him, and to press forward toward the goal of success. Prejudice would have hindered him.

Did you ever notice how contestants in a running match never look behind but always keep their eyes on the winning post? They have trained themselves to forget to remember everything except the goal ahead.

So, let us be *good forgetters*. The best way to start in dead earnest is to remove all those mental tags of "Old Crab" we have hung on certain drops on our switchboard. Surely, life is too short to remember anything that prevents us from doing our best. Be willing to give "second-mile" service in addition to giving "just what is required" service. It will show up in the spirit of our service as well as in the letter of our rules.

does it give sanction to any management disregard for the rights of those served.

In order to reach the common objective of those responsible for the telephone industry and of the public, which is and should be a telephone service continuously being made better and at the same time an economical service, appointments to regulatory commissions must be of the highest standard. Men on commissions must be selected because of their experience and standing among their fellow men.

No Place for Politics in Commission Regulation

Decisions by commissions should not be subjected to captious or insidious criticism or objection, either by the telephone industry or the public. On the other hand, where there is apparent failure of a commission to perform its duty, there should be an orderly appeal to court, and this appeal should not be regarded or construed as a resistance to constituted authority. Fundamentally, there is no place for politics in commission regulation either on the part of management to obtain unfair advantage of the public or the public or its representatives to embarrass or hamper the industry.

A long non-political term of office, therefore, is essential, and reappointment of experienced and suitable commissioners should be an established practice. In fact, appointment for life might well be given serious consideration. In order to procure citizens of the best type to occupy these positions, sufficient compensation should be paid to command that sort of people. There should be a staff of skillful and well-paid employes so that the commissioners can have the necessary advice and assistance without being overworked. A body that is overworked cannot be deliberate.

The whole purpose of commission regulation should be an encouragement to management to look properly after the present and future telephone requirements of the public, and the industry should be alert at all times to adopt improvements that will better or enlarge the service or lower its cost.

Inherent in any system is the well-being of the employes engaged in rendering the service, as satisfactory service can be had only with a properly compensated group of employes, instilled with a spirit to serve. Due regard must also be present for the protection of the investment that has made telephone service possible.

During the past year regulation of the telephone industry from a national standpoint has been moved from the Interstate Commerce Commission to a new commission, known as the Federal Communications Commission, which has jurisdiction over telephone, telegraph and radio, largely from an interstate aspect. Among other things that this commission is undertaking is an investigation of the Bell System. Much publicity accompanied the inauguration of this commission and the appropriation for the investigation of the Bell System. On November 17, 1934, Walter S. Gifford, President of the American Telephone & Telegraph Co., made the following statement:

> In a business as extensive as ours which so vitally concerns so many people, the public has a right to the fullest information as to how its affairs are conducted. We, therefore, have no objection to investigations by properly constituted authorities at any time. We have no skeletons in the closet to be exposed.
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> It is regrettable—although perhaps inevitable—that public investigations should be disturbing to confidence, at least until all who have criticisms to make have made them and the company has had an opportunity to reply. We are primarily concerned with furnishing the people of this country with the best possible telephone service at the lowest possible cost, consistent with fair treatment of employes and those who have invested their savings in the business. We believe there is no conflict between our aim and the aim of the Federal Communications Commission and we welcome the opportunity to place before that body all the facts as to the manner in which our business is conducted.

During the whole life of the telephone industry it has paid attention to human relationships and has sought always to merit confidence. The social utility of the telephone was greatly enhanced by the increased development during prosperous times, and we should not only preserve but should also extend that development. The industry has suffered during the depression along with others. If it has suffered less, it is because it has on the whole remained steadfast in its obligation of service and has not departed from fundamental principles.

In the past the industry has solved financial, technical and operating problems relatively as great as those that exist today, and we may well have confidence in our ability to solve the problems of today. The solution of these problems will continue the telephone in the public esteem and bring freedom in the management of our industry.

Telephone Transmission Theory

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ARTICLE NO. 11, Part I, in series on fundamental principles of electricity for the telephone worker. This article takes up a discussion of the use of electrical energy to send communication signals over telephone wires. Also how to improve transmission by inductively loading the telephone circuits

ELECTRICAL ENERGY is used to transmit intelligence between two points. This energy may be directed to the distant point by wires, or it may be sent through the intervening space by a radio or wireless transmitter. Most telephone workers are interested largely in sending communication signals over wire lines, and this subject will be considered in this article.

Electromagnetic Waves: In electrical work, it is common to assume that the electrical energy flows *through the wire*. Now, the *electrons* are in the wire, and these do move through the wire according to accepted theory. It is rather surprising to find, however, that the *electrical energy* is not *in* the wires but is in the region *about* the wires. Thus, when two persons located in distant cities are talking over the telephone, it is quite true that currents are flowing in the wires, but most of the electrical energy is being transmitted in the *dialectric* field *between* the wires and in the *magnetic* field *around* the wires.

The dielectric and magnetic fields moving along the wires from the sending to the receiving station unite to produce what is called an *electromagnetic wave*. Electrical energy, whether in a power system or a communication line, is sent along the wires as electromagnetic waves. In radio or wireless transmission, the electromagnetic waves are broadcast (or directed in directional systems) into the ether (or space), and some of this energy from the waves is intercepted by the receiving antenna and amplified to reproduce the message.

Waves Along Wires: In order to understand the way in which these waves are produced and transmitted, suppose that the vacuum-tube oscillator of Fig. 1-B is connected to a telephone line 360 miles long. The distant end of the line is connected to an impedance load of such value that all the received energy is dissipated in the load, and none is reflected back toward the sending oscillator.

An electromagnetic wave travels in free space with a velocity equal to that of light, or 186,300 miles per second. In telephone circuits, a wave travels somewhat slower than this, depending on the type of circuit. The velocity is about 180,000 miles per second on an open-wire telephone line, but may be as low as 10,000 miles per second for heavily-loaded cables.

The voltage of the oscillator is passing through sine wave variations as shown in Fig. 1-A. Suppose that at a given instant, a maximum value of voltage is being impressed on the line. This voltage will establish a maximum *dielectric field between* the wires, and will also cause a current to flow. This current will establish a maximum *magnetic field around* the wires, and this field, together

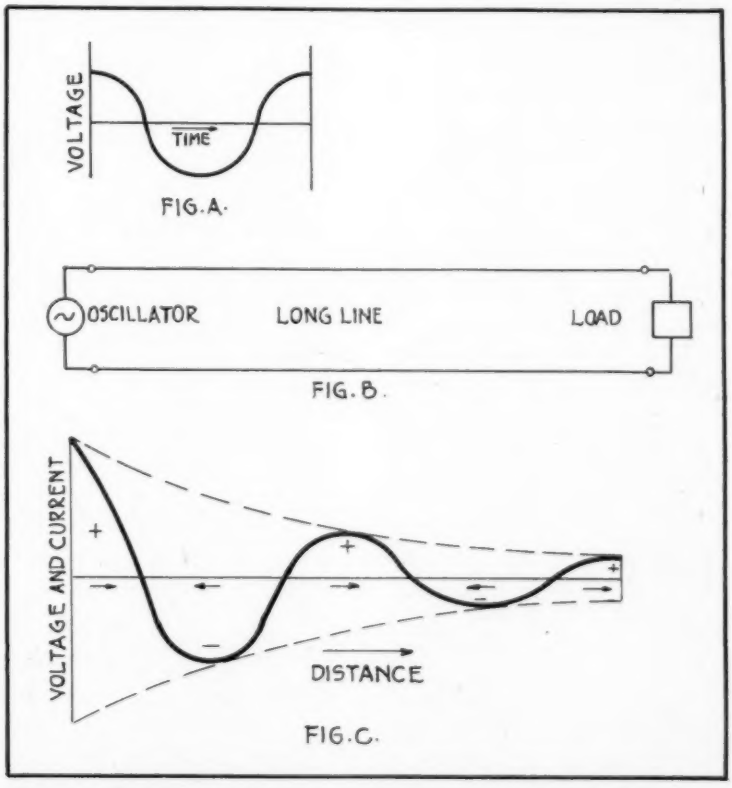


Fig. 1. If an Alternating Voltage (One Cycle of Which Is Shown in Fig. A), Is Impressed on a Long Line (Fig. B), the Current and Voltage Distribution at a Given Instant Is as Shown by the Wave in Fig. C if the Line Is Terminated in Its Characteristic Impedance. The + and — Signs Indicate When the Voltage Is Positive and Negative Along the Line. The Arrows Show the Direction of Current Flow at a Given Instant.

Answers to Problems in Tenth Article, "The Solution of A.C. Circuits"

The answers to problems, concerning principles of electricity, given in tenth article of this series entitled "The Solution of Alternating Current Circuits"—published in TELEPHONY of June 15—are as follows:

27. Line current = 0.00789 ampere.
    Voltage across resistor = 2.37 volts.
    Impedance of coil = 659 ohms.
    Voltage across coil = 5.2 volts.
    Voltage drop in oscillator = 4.73 volts.
28. Reactance of condenser = 39.8 ohms.
    Impedance of circuit = 107.5 ohms.
    Line current = 0.093 ampere.
29. Inductance for resonance = 0.0352 henry.
    Current at resonance = 0.18 ampere.
30. Reactance of coil = 100.5 ohms.
    Impedance of coil = 104.8 ohms.
    Current through coil = 0.0954 ampere.
    Total line current = 0.157 ampere.
31. Reactance of condenser = 39.8 ohms.
    Current through condenser = 0.251 ampere.
    Total line current = 0.27 ampere.

with the dielectric field, constitutes an *electromagnetic wave.*

This wave is traveling at 180,000 miles per second, and hence will have reached the distant end of the 360-mile line in 360/180,000 or 0.002 second. But in this time, the voltage of the 1,000-cycle (per second) oscillator has passed through *two complete cycles,* and has also impressed these voltage variations on the line. These waves have also traveled toward the distant end. Thus, at a given instant, the *electromagnetic waves* along the line will be somewhat as shown in Fig. 1-C. This wave also represents the voltage and current distribution along the line at this instant.

It is interesting to note that at *certain points* along the line the voltage and current are both zero (crossing the zero axis) at a *given instant.* Fig. 1-C also shows that the voltage values are + at certain points and — at others. Somewhat more startling is the fact that although the line is directing electrical energy *toward* the receiving load, at certain parts the *current* in the line is actually flowing *toward* the oscillator. An analogy will help to clarify this.

If a pebble is thrown into a pond of water, the water particles themselves do not rush out from the source of disturbance to the bank. They are merely set in motion by the pebble, and their motion transmits the water wave toward the shore, where the energy of the wave will tend to wash away the bank.

From the discussion in this section, it follows that if the 1000-cycle oscillator were connected to a line 180,000 miles long for one second 1000 complete wavelengths would be included along the line. Each wave would, therefore, be 180,000/1000 or 180 miles long. It can, therefore, be written that the wave length, λ, equals the wave velocity, V, divided by the frequency, f, or

$$\lambda = V/f \qquad (1)$$

Attenuation: It is seen that as the electromagnetic wave of Fig. 1-C approaches the distant end of the line, the amplitude of the wave is reduced. This also means, then, that the magnitude of the voltage and the current received at the distant end of the line is less than at the oscillator. This is due to the losses in the line, and is called *attenuation.*

Now, the attenuation of the line decreases the voltage and current in an interesting manner. For example, assume that each 10 miles of a line reduces the voltage, say, 5 per cent. At the end of the first section, the voltage will be 95 per cent of that at the oscillator. At the end of the second section, it will be 95 per cent of 95 per cent or 90.2 per cent. At the end of the third section, it will be 95 per cent of 90.2 per cent or 85.7 per cent, and so on.

This manner of decrease causes the *envelope* of the electromagnetic wave to be as shown by the dotted line in Fig. 1-C.

Referring again to this figure, it should be pointed out that although the *instantaneous* values are as shown by the *solid* line, and are actually zero at certain points, this is *not* true for the *effective* values. The effective values are those which would be measured by an a-c voltmeter connected *across* the line wires, or an a-c ammeter connected *in* the wires. These instruments read a-c effective values, and hence would read at all times, values represented by the distance from the zero axis to the dotted line.

Characteristic Impedance: When the oscillator of Fig. 1-C was connected to the line, the impressed voltage caused a current to flow. The question arises: What is the value of this current? The *apparent* answer would be that it would be the closed-circuit voltage of the oscillator divided by the sum of the load impedance and the series line impedance.

If the line were *electrically short,* this would be the case, but telephone lines are *electricially long.* By this is meant that the frequency is relatively high (say 1000 cycles), and the line losses, and thus the attenuation, are large. Also, the lines themselves are often quite long.

For a *long* telephone line, the current input is not determined entirely by the impedance of the load. The important factor determining the current input is the *characteristic impedance* of the line.

The characteristic impedance of a line can be defined as the input impedance of an infinite line. Or, to be more specific, if the voltage impressed across a theoretical line extending to infinity is divided by the current flowing, the characteristic impedance will be obtained. This will usually be composed of both resistance and reactance. Thus, Fig. 1 and the accompanying discussion is not *exactly* correct.

At 1000 cycles, the characteristic impedance of a typical open-wire line is 610 ohms resistance and 57 ohms *capacitive* reactance. For a typical cable circuit, the reactance is very much higher. The current in Fig. 1-C should really be ahead of the voltage, but the two waves are there shown in phase.

Thus far, little has been said about the practical importance of the characteristic impedance of a line. This can be explained in the following manner: Suppose that an electromagnetic wave is sent down a uniform infinite line; none of its energy would ever be reflected back, it would keep going on forever. Now, suppose that a line 200 miles long is cut off of this infinite line, and suppose that this 200-mile section is to be used for an actual telephone line

between two cities. How shall it be terminated?

If it is open-circuited or short circuited, all the energy arriving at the distant end will be reflected back. It must be terminated with a load (telephone equipment) having an impedance, but what shall this impedance be? The answer is evident:

Terminate the 200-mile section with a load having an impedance equal to the impedance of the rest of the infiinite line after the 200-mile section is removed. But, removing 200 miles from an *infinite* line has a negligible effect on the line, and hence the impedance measured at the terminals of the infinite line after removing 200 miles is still the characteristic impedance.

Thus, to prevent reflection from the end of a line, *the line should be terminated with a load having an impedance equal to the characteristic impedance of the line.* This means that a line must be terminated with *both* resistance and reactance, if all reflection is to be prevented. But, for most practical work, an open-wire line can be terminated for testing or other purposes with resistance only. It is quite common to use a 600-ohm or a 700-ohm resistor for this termination, depending on the wire size.

Distortion: From the preceding discussions, it appears that the current input is determined by the *voltage* and the *characteristic impedance* of a circuit; also, that the voltage and current cause an electromagnetic wave to travel along the circuit at a given *velocity of propagation*; and finally, that as this wave travels it is *attenuated* or decreased in amplitude by the losses in the line.

These three factors, *characteristic impedance, velocity of propagation,* and *attenuation* will now be considered in more detail.

Although the equations for these three values will not be reproduced here, the *frequency* of the wave being transmitted enters into each term. Thus, since the characteristic impedance determines the current which a given voltage sends into a line, and since this impedance varies with the frequency, more current will flow at one frequency than at another, and distortion will result. Also, the frequency of the wave being transmitted enters into the equation for the wave velocity.

Hence, a longer period of time will be required for waves of one frequency to travel a given distance than for waves of another frequency. Thus, in the case of complex speech and music waves, some of the components will fall behind others, and they will arrive at the distant end of the line out of their proper relationship. This will also produce distortion.

Finally, since the attenuation a line offers also varies with frequency, the line will offer greater loss to some components than to others, and thus transmitted speech and music will be distorted.

Loading: A telephone line is in reality an electrical network composed of series resistance, R, series self-inductance, L, capacitance between wires, C, and leakage, G, between wires. Of course, these values are distributed along the line, but a line may be considered as being composed of many sections, each of which contains small amounts of R, L, C, and G, as shown in Fig. 2.

To explain fully the theory of loading requires extensive use of mathematics. Very briefly, however, loading means the addition of inductance (usually in the form of coils inserted in series with each line wire at regular intervals) to the line. The addition of the correct amounts of inductance accomplishes four desired things:

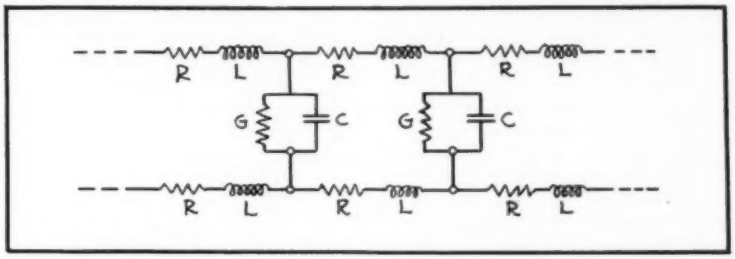


Fig. 2. A Telephone Line Is Electrically Equivalent to a Network Composed of Many Sections.

First, the *characteristic impedance* of the circuit is made *independent of frequency.* Thus, the currents entering the circuit are independent of frequency. Also, the characteristic impedance is made to be *pure resistance,* and is increased to a *higher value* than for an unloaded circuit. Thus, the current is *in phase* with the voltage; also, a *higher voltage* can be used in transmission because of this increase, and since the current is smaller there will be less I^2R losses in the line.

Second, loading a circuit makes the *velocity of propagation independent of frequency.* That is, all components travel at the same rate, and thus they all arrive at the receiving end in their proper phase relations.

Third, the *attenuation* is made independent of frequency. Thus, all the components of a complex speech or music wave will be attenuated or decreased in amplitude the same *relative* amounts. In this way the relative magnitudes of the various frequency components are the same at the receiving as at the sending end.

Fourth, loading makes the attenuation the *least* possible value.

Now, of course, the discussions just given, including the benefits to be obtained by loading circuits, were theoretical. Actually, there is some loss in the loading coils themselves, and their addition to a circuit tends to offset some of the theoretical advantages gained. Hence, it should be said that the four benefits of loading are not quite fully obtained in actual installations. That is, the transmission phenomena are never quite independent of frequency, and the attenuation does not reach the theoretical minimum value.

There is another important reason circuits are not so heavily-loaded as theory would indicate they should be. Heavily-loaded circuits have a low velocity of propagation, and thus the waves travel along the line more slowly. Reflections from an irregularity in a line will arrive back at the sending station a greater length of time after the original signal left if the wave velocity of the line is low than if it is high. Thus, irregularities which might not cause trouble in unloaded lines, may cause serious echoes in heavily-loaded lines.

An analogy may help to explain this phenomenon. If a person faces a large reflecting surface—such as the side of a building—and speaks loudly, he will not hear the echo if he is close to the building (or if the wave travels very fast as in an unloaded line). If he is at some distance (or if, as in a loaded circuit, the wave travels slowly) he will hear a distinct echo. A pronounced echo in a telephone line would be quite disturbing to those carrying on a conversation.

Types of Loading: Two fundamental types of loading have been developed. These are: *lumped loading* and *continuous loading.* The first of these is used for loading land *telephone* lines, and the second for long

submarine telephone or telegraph cables.

Although the preceding section used open-wire lines as illustrations in discussing loading, such lines are no longer loaded in this country. Loading is, however, still extensively used on long toll cables and other important cable circuits.

In loading land cable circuits, the inductive windings of the loading coils are inserted in each line wire at definite intervals. The spacing is determined by such factors as the type of cable, the upper frequency to be transmitted, and the inductance of the coils. Coils having cores of permalloy are used in modern installations.

The long submarine cable circuits used for transoceanic telegraph or telephone service are continuously loaded by wrapping the central current-carrying conductor with an iron or permalloy tape of high permeability. This tape increases the magnetic lines of force which a given current produces, and will, therefore, increase the self-inductance.

Reflection: If a circuit is uniform, has no irregularities such as poor splices, and is correctly terminated in its characteristic impedance, the electromagnetic waves should travel without reflection to the distant load where their energy will all be absorbed. If these conditions are not met, however, energy will be reflected back toward the sending end from any irregularity or improper termination.

This reflected energy will be in the form of a reflected wave, just as an oncoming water wave will send back smaller waves when it strikes an irregularity (such as a piling) as it proceeds to the shore. When a reflected wave finally reaches the transmitting end of a line, it will combine with the oncoming impulse from the source (the oscillator of Fig. 1).

Assuming that the velocity of propagation is constant, the *way* in which the reflected wave combines with the oncoming wave *depends* (in general) on the *distance* to the irregularity and the frequency. The reflected current wave will add at some frequencies to the current which enters the line and will subtract from it at other frequencies. Now, if the net or combined current which enters a line varies with the frequency in this manner, so will the impedance of the line (since $Z = E/I$) vary with frequency.

Thus, if the impedance of a line is measured at various frequencies with an impedance bridge (to be discussed in a following article) it is possible to determine the *distance* to an irregularity. This is, of course, an advantage in locating trouble. It should be remembered that wave reflections may cause appreciable distortion as explained in the discussion on loading.

Summary: The electrical energy carrying the communication signals travels from the sending to the receiving end of a line in the form of electromagnetic waves. These waves travel with a velocity approaching that of light.

As the waves travel along the line, they are attenuated or decreased in amplitude by the losses in the line. If the line has any irregularities in it, or is not terminated in its characteristic impedance, a reflected wave will result. This wave will cause distortion.

Cable circuits are loaded to improve their transmission characteristics by decreasing distortion and attenuation. The land cables are lumploaded by adding inductance coils at regular intervals along the line. Submarine cables are continuosly-loaded by wrapping the cable conductor with a magnetic tape.

Problems:

32. A 1000-cycle voltage is impressed on an open-wire line. Compute the length in miles of one wavelength, of one-half wavelength, and of one-quarter wavelength.

33. Compute the wavelength of a 60-cycle power line wave (assume the same velocity as for a telephone circuit).

34. If the characteristic impedance of a telephone line is 610 ohms resistance, and 57 ohms capacitive reactance, compute the numerical value of the impedance. Also, determine the angle between the impedance and the resistance.

35. A voltage of 0.775 volt is impressed on the line of problem 33. Compute the current which will enter the line, and find the angle by which this current leads or lags the voltage.

36. The characteristic impedance of a typical non-loaded cable circuit is 340 ohms resistance and 314 ohms capacitive reactance. Compute the numerical value of the impedance, and find the angle between the impedance and resistance.

37. If a voltage of 0.775 volt is impressed on this cable circuit, what current will flow into the cable and by what angle will this current lead or lag the voltage?

38. When the cable of problem 36 is heavily loaded, the resistance is 1660 ohms and the capacitive reactance is 80 ohms. Compute the numerical value of the impedance, and find the angle between the impedance and resistance.

39. If a voltage of 0.775 volt is impressed on the cable of problem 38, what current will flow into the cable, and by what angle will this current lead or lag the voltage?

Work out the answers to these problems and hold them to compare with the correct answers. These will be published with the next instalment of this series of articles.

• • •

Station Statistics of Lincoln (Neb.) T. & T. Co.

The Lincoln (Neb.) Telephone & Telegraph Co. made a net gain of stations during June of 217, and up to July 15 had added 151 more. The June gain is the largest of any June since 1927, when 447 stations were added. Beatrice, Lincoln and York districts made substantial gains but the Hastings district, caught in the floods, lost 21.

June also set a new high for the number of exchanges participating in gains, 81 out of 130 reporting additions. This was two more exchanges than in May. Twenty-five had a loss of 143 telephones, 13 lost one each and 24 neither gained nor lost. The net gain for the six months of this year is 639 as compared with 556 for the same period last year.

The total number of stations in service July 1, says General Commercial Superintendent McCulla, was far below the peak of 83,729 telephones in service reached in April, 1930.

The total number of outward long distance messages originating in the territory for the first half of the year increased 7½ per cent above the total for the same period last year, but the record shows the company has attained only 47.2 per cent of the yearly message quota to date.

Last year, after a splendid beginning, the sales forces ran up against the drouth, and only concerted efforts in the last few months of the year saved the company from a net loss in 1934. This year, crop conditions have been very favorable, and 40 million bushels of wheat, 60 or 70 million bushels of oats and greatly increased crops of rye and barley are in process of being harvested.

Black rust cut off 20 million bushels of winter wheat, but alfalfa and hay yields are heavy. Pastures are back to normal, with a resultant good effect on dairying. Corn planting was delayed two weeks because of wet weather, but high temperatures the first half of July have placed it in good condition.

Mr. McCulla is planning for a 100-per cent participation and constant effort for the remainder of the year. During June 354 employes sold 393 items of service. The company has 1269 employes.

The Court Disposes

MORE AND MORE it becomes apparent that, as we have previously remarked in these columns, regulatory commissions propose and a court disposes. The latest case in point is the recent decision of the Appellate Division of the New York Supreme Court rejecting, among other things, the proposition that utility property must be carried on the books of the owning company at original cost.

The irony of this decision is that it overturns an order of the New York Public Service Commission, of which the chairman, Dr. Milo G. Maltbie, is probably the leading exponent of the theory that utility companies should be compelled to carry their property on their books at original cost. It is said to be largely through Dr. Maltbie's efforts that the Federal Communications Commission adopted this theory in the new Uniform System of Accounts for telephone companies, to become effective January 1, 1936.

Sometime ago the New York commission issued orders instructing various utilities subject to its jurisdiction—power, gas, steam and water companies—to immediately redistribute their fixed capital accounts so as to show on their books the original cost of their property "at the time when it was first devoted to public service, whether by the accounting company or by a predecessor public utility." And difference between such original cost and the existing fixed capital account was to be carried to an account entitled "suspense to be amortized," which amount was to be "written off over such period and in such manner as the commission may by order prescribe."

The commission also put into effect the straight-line depreciation method; required by order that capital stock expense should be amortized in a certain manner; created a special expense account for regulatory commission expenses, and ordered the maintenance of a perpetual inventory. Thirty-eight utility companies operating in the state of New York objected to these new accounting requirements, and took the commission into court. The decision (TELEPHONY, July 20) referred to, handed down June 27, is on this case.

AS TO ACCOUNTING on the basis of original cost, the court pointed out that the books of a utility corporation are not kept solely for the information or benefit of the commission; that stockholders, bond-owners and the investing and service-using public are also interested.

The court remarked that this commission had in the past approved many of the entries on the books of these companies, reflecting purchases of properties and the accounting therefor; that financing had been carried on and transactions made upon this basis; that to require the companies to show a loss on their books when none had been suffered is arbitrary, and to require them now to charge off a part of their plant value is confiscation.

Regarding the depreciation accounting plan set up by the commission, the court said that not only had the United States Supreme Court disapproved the "straight-line" method of depreciation, but that the New York commission had no authority to put such method into effect.

The court said, in finding the commission's order ultra vires: "The petitioners argue that depreciation is a matter individual to each company, and requires business acumen and judgement; that it is a managerial problem which should not be controlled by the uniform system of bookkeeping established by the commission."

The commission's order regarding capital stock expense required all expenses in connection with the issuance and sale of capital stock be amortized out of income.

"Expenses for taxes, printing, legal services and underwriting in connection with a stock issue, have been held to be elements of value on which a utility corporation is entitled to receive a return," said the court. "The order in this regard is confiscatory, as it requires these elements to be charged off to surplus."

THE COMMISSION'S requirement as to accounting for regulatory expenses provided that such expenses would be carried to a suspense account, which could not be charged to operating expenses unless and until approved by the commission. The court held this order to be an unwarranted assumption of authority by the commission, and it is said that, even if the legislature had granted the commission such a power, a serious question as to its constitutionality would arise.

The court held that the commission had the right to require a perpetual inventory, as direct authority for this had been given the commission by the legislature.

While this decision is, so far, local in character, and is based partly on the statutory authority of the New York commission—which differs, of course, from the power of other commissions, including the FCC—and while the decision is that of a lower court, it is timely so far as both state commissions and telephone companies are concerned, in that it will be an incentive to all commissions to examine their own statutory powers before making effective in toto the new Uniform System of Accounts for telephone companies promulgated by the FCC.

The New York decision will doubtless be appealed to the higher state court; possibly, then, by one side or the other, to the United States Supreme Court on the question of confiscation.

Naturally, neither commissions nor utilities want avoidable litigation; it is to be hoped, therefore, that these matters will be clarified before telephone companies are required to go to the expense of setting up their accounts on a new basis which might not be permanent.

Safety Test No. 5

By JAKE THE LINEMAN

MORNIN' buddies! Wa'll how are things a'perkin' along today? 'Bout this time last month I sprung a test on you an' all of us had a grand old time findin' out just what we knew about safety as it is used in the telephone industry. Today I am back on the job with another bunch of questions for you buddies to answer.

I want to make safety test No. 5 into one of the biggest and best tests we have ever had. To do that I'm gonna need the cooperation of every buddy. I think I can get that cooperation if I just tell you a few facts about the safety tests.

First, the safety test which I am giving today is the fifth one given this year. So far hundreds of telephone workers have participated in the tests. And their grades prove that the tests have made them more conscious of the importance of practicing safety. Many who made low grades in the first tests have shifted into high gear and are now making the Honor Roll.

Second, the companies which are sending in the papers of all their men and offering prizes to their employes who make the Honor Roll are discovering that, on the average, their employes are thinking more about safety and its related subjects. This fact is proved by the gradual boosting of the average grades of the group participants.

Third, the company employes who make the Honor Roll are receiving compliments from their supervisors for their work. Last month, the employes' magazine published by The Chesapeake & Potomac Telephone Co. of Virginia gave Buddy T. D. McNeal, an employe of the company who had been a regular winner in the tests, a nice writeup, complimenting him on his interest in safety.

Fourth, the tests are clearing up many troublesome points. Last month I asked the buddies to give the correct treatments for sunstroke and heat exhaustion. Over 50 per cent of the entrants missed out on the question because they thought sunstroke and heat exhaustion were the same, both in symptoms and in treatment.

In the correct answers we thoroughly covered the two subjects and I believe that we were able to iron out the difficulties. By doing so we may have given many a telephone worker suggestions which some day may be of valuable assistance.

Every telephone worker who participates in test No. 5 will receive a correct copy of the answers, his graded paper, and *a special surprise* which will be interesting as well as helpful to every telephone worker.

In addition to receiving the answers, every participant has a chance to make the Honor Roll which is published in TELEPHONY at the same time the answers are printed. And take it from your old pal—the Honor Roll is worth shooting at.

In order that I can handle every detail of the test as promptly as possible, please observe the following rules:

1. Study all questions carefully. Make sure you answer every part of each question.
2. Write out the answers in any form—just be sure to write them. Then send them in to Jake, The Lineman, care of TELEPHONY, 608 South Dearborn St., Chicago, Ill.
3. Attach a self-addressed stamped envelope to your answers. This envelope will be used to return to you your corrected papers and your copy of the answers.
4. Please endeavor to get your answers in to me not later than August 12.

And now for the question. Got your thinkin' caps on? O.K.—here they come:

1. Because of the fact that many telephone lines are built along railroad right-of-ways, which are hard to get to with trucks and trailers, it is sometimes necessary to unload poles from moving trains. On such jobs should: (A) Poles longer than 35 feet be unloaded while the train is in motion? (B) A protection be placed between the ends of the cars on which men will be working to do away with any possibility of the men falling between the moving cars? If so, what kind of a protection should be used? (C) "Cant hooks" or "peavies" be used to shift and move the poles?

2. In inspecting screwdrivers for defects, what important conditions should you be on the lookout for?

3. Suppose one of your buddies has been overcome by gas while working in a manhole, how would you rescue him from the manhole? If his breathing had stopped, how would you attempt to revive him? Answer each part fully.

4. Answer the following questions with either "yes" or "no."

(A) Do stopping distances depend largely upon how fast a car is traveling?

(B) In residential sections where cars may be parked in driveways, for the safety of the children is it safe to park at the curb?

(C) Can a pedestrian cross a street more safely in the middle of the block than at marked intersection?

(D) Is it dangerous to pass another car on the right because the driver of it may pull over to the right and crowd the passing car to the curb or off the road?

5. In hoisting hot paraffin or metal up to a splicer, should the dipper or ladle be left in the pot? Give reasons for your answer.

6. In your opinion what careless action caused this accident: "A cable splicer's helper was working on the ground under a cable platform upon which a splicer was cutting a piece of lead sheath off a cable. After removing the sheath the splicer laid it on the platform. It slipped. The splicer yelled 'Look out!' The helper looked up, and the piece of lead sheath hit him in the mouth."

7. On a jointly-owned pole what should be the vertical clearance between the telephone company's crossarm and the power company's crossarm?

8. In your opinion should the following conditions be classed as hazardous? Explain reasons for your answer.

(A) Power company's transformer on a telephone company pole below the telephone company circuits.

(B) Telephone company pole line with power company crossarm attached below the telephone company's cable.

(C) A 2,300-volt power company circuit over a telephone company lead with only a ten-inch clearance.

9. What precautions should be taken when using a lineman's test set on open-wire lines to locate trouble when tests made by the test board indicate that the trouble is due from contact with electric supply circuits? Explain your answer.

10. If you discover a hazard which will prevent you from doing your work safely, what procedure should you follow?

Wa'll, thar you are, buddies. Who's gonna make TELEPHONY'S Roll of Honor for August? Get your answers in early. The more answers I get, the better I'll feel. So came on, get in on the fun.

I guess I'll get along, so until next time remember:

"What the ant laboriously drags into a heap, the wind of accident will collect in one breath."—Schiller.

● POPULAR FALLACIES OF THE TELEPHONE BUSINESS . . . NO. 5 ●

"WHEN SOMETHING GOES WRONG WITH OUR MANUAL BOARD WE CAN FIX IT, BUT AUTOMATIC EQUIPMENT IS OUT OF OUR CLASS"

It is significant that the only people who refer to automatic equipment as being complicated are those who have never used it. Telephone companies who know automatic through actual experience with it seldom think of it as being difficult to understand.

After all, the real test of simplicity is "Will the equipment render unfailing service at a low cost for maintenance?" By this test, Strowger Automatic is as simple as any type of switching equipment made—as easy to understand, and as inexpensive to keep in order.

For evidence of this, consider the hundreds of Strowger Automatic exchanges in operation today—ranging in size from a dozen rural lines to many thousands of city lines—which are today being easily and economically maintained by the same employees that cared for the former manual equipment. These men can testify how quickly the "intricacies" of automatic operation disappear—how soon familiarity with automatic equipment breeds confidence in its performance.

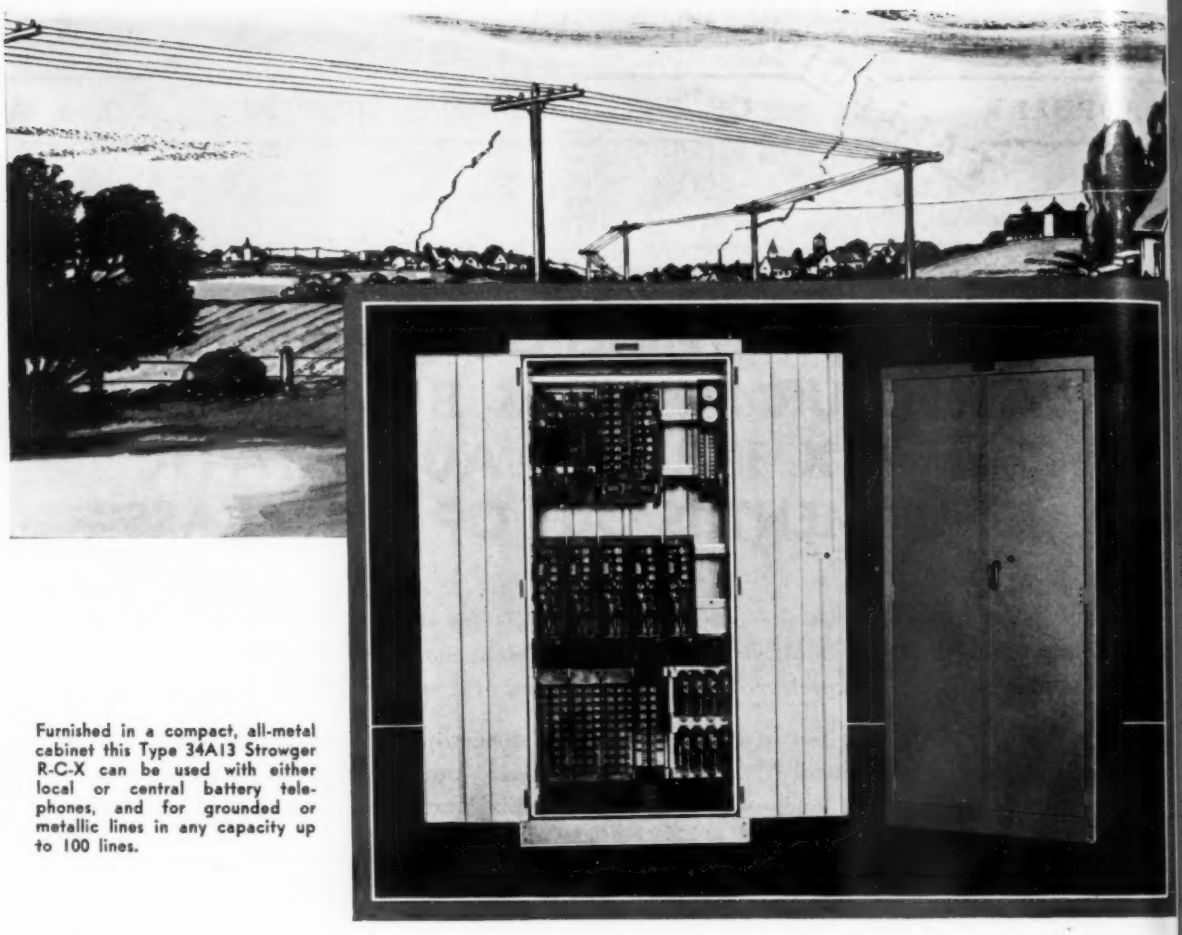
Don't let the illusion of "complexity" keep your company from enjoying the benefits of automatic operation. Once you install Strowger Automatic, the illusion disappears forever and your company's real progress will begin.

American Automatic Electric Sales Company, 1033 West Van Buren Street, Chicago.

For modern service and maximum economy in small exchange operation, install the

STROWGER C-A-X

(Community Automatic Exchange)



Furnished in a compact, all-metal cabinet this Type 34A13 Strowger R-C-X can be used with either local or central battery telephones, and for grounded or metallic lines in any capacity up to 100 lines.

WHAT THE R.C.X. DOES *for the* TELEPHONE COMPANY

"We realize that the R.C.X. gives the subscriber improved service", said a telephone manager the other day. "But just what are its advantages to the telephone company?"

To answer this question, we have outlined below the chief advantages of R.C.X. operation to operating companies. We commend this summary to the careful study of rural exchange owners everywhere who wish to improve the financial position of their companies.

1. Initial cost of R.C.X. is very low in proportion to the annual savings effected.
2. R.C.X. operation retires complete investment in from four to six years.
3. It completely eliminates local traffic expense.
4. No change necessary in lines, telephones or method of operation.
5. Cost of housing facilities drastically lowered
6. Relatively low depreciation rate, due to longer physical life and lower rate of obsolesence.
7. Produces gain in number of stations (and gross revenue) as a result of improved service.

That telephone companies place a high value on these factors is indicated by the large number of R.C.X.'s sold and installed during the last year. Send for further information telling us the size of your exchange so that we can quote prices on a unit suitable for your needs.

AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 WEST VAN BUREN STREET CHICAGO

The New West Test Set, shown with cover open ready for use.

Every Lineman Should Be Equipped *with this* NEW WEST TEST SET

The New West Test Set, with cover closed. Price — Aluminum Covered Wood Case—$40.00. Leather Case —$42.50.

Retaining the many advantages which have made it the world's most widely used lineman's set, the new West Test Set has been made a still better value by the addition of a number of valuable new improvements. Here are some of its features of operation—

1. Has handset type combined transmitter and headband receiver. This latest improvement leaves both hands free while testing.
2. A combined portable telephone and test set. The West Test Set combines two instruments in one—portable telephone and fault-finder.
3. Indicates direction of, and distance to, all line faults. "Finder coil" principle is simple, easy to use, and surprisingly accurate in results.
4. Is completely insulated and weatherproof at all times. Can be used under any condition of weather—rain, sleet, snow or sunshine.
5. Has rugged, compact carrying case with shoulder strap. Convenient to carry and use—built for the hardest usage.

AMERICAN AUTOMATIC ELECTRIC SALES COMPANY

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THE tremendous success scored by the Type 34A3 self-contained Monophone, has focused the attention of telephone engineers everywhere on the superior features of this modern instrument.

First, and most important, there is no bell box. The ringer is contained within the compact, one-piece base. This makes it possible to stock the same model for either manual or automatic usage — the addition of a dial being all that is necessary to convert from one to the other.

In dialing a number, this new Monophone does not slip, even on the smoothest surface. This is due to the instrument's substantial weight and extra-solid construction—which also results in less maintenance and an exceptionally long, useful life.

The Type 34A3 Monophone has many other advantages just as important, both to the user and to the telephone company. Write *today* for prices and complete information.

AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 WEST VAN BUREN STREET CHICAGO

Mileage Charges Before Bay State Commission

By H. S. KNOWLTON

CITIZENS of Tewksbury, Mass., allege discriminatory rates on New England Telephone & Telegraph Co. system. Sparsely-settled territory justifies differential, the company maintains

A LARGE number of subscribers of the New England Telephone & Telegraph Co., residing or doing business in Tewksbury, appeared before the Massachusetts Department of Public Utilities on July 15 in support of a petition for reduced rates in that area of the Lowell exchange. Mileage charges were the chief bone of contention, and much was made of the existence of lower prices for service in a number of other communities no farther away from the Lowell central office.

The company defended the existing tariff on the ground that Tewksbury is a much less thickly settled area than the other regions brought into the case. The petition is of considerable interest in view of the large number of similar communities in Massachusetts which would be affected by a ruling on the ground of discrimination. Commissioners Wells, Leary and Hardy sat in the case, the first presiding.

William B. Carter of F. E. Carter & Sons, a florist and leading petitioner, stated that his place of business is 1.5 miles from Tewksbury center and six miles from the Lowell central office. He said that his firm is now paying $5.05 per month for service on a four-party line, this cost being made up of $2.25 base rate and $2.80 mileage.

In April of this year he applied for a private business line and was informed that it would cost him $16.80 per month, of which $7 is the base area rate and $9.80 the mileage charge. This he considered too high for the service. The speaker declared that in his opinion no subscriber in an exchange should be required to pay more than any other, and that if the extra cost of lines reaching out beyond the base area were absorbed by all the subscribers in the Lowell exchange, it would be low per subscriber.

The witness said further that since 1920 the town of Tewksbury (where no central office exists) has expended $44,000 for street lighting extensions. He alleged that the telephone company utilizes the street lighting poles for carriage of its overhead wires and that this should be a factor in reducing rates. The neighboring towns of Chelmsford, North Chelmsford and Dracut, he asserted, are required to pay only the base area telephone rates, while the Tewksbury base area starts at the Lowell-Tewksbury line. This makes it difficult for Tewksbury to compete with the other towns, Mr. Carter said.

Irving F. French, chairman of the local board of selectmen, said that 25 years ago a farmers' line was the reliance of the neighborhood. Service improved when the exchange was transferred to Lowell, but lately it has been deteriorating. Two years ago lower rates were asked for, but without result. He requested the board to order a flat rate into effect, as in surrounding towns. In one case, Mr. French said, two garages are located on a 15-party line.

Selectman Everett H. King protested that discrimination exists between Tewksbury and the nearby places, and urged that the growing population of these suburban places warrants rate consideration and equality of treatment.

John T. Gale, another florist, said that he had given up a private line which he had used for 25 years, and had now a four-party line which he felt should cost less. Representative Ralph R. Currier of Wilmington contended that the company should treat all similarly located towns alike in its tariffs. He maintained that a 15-party line is most unsatisfactory for use in business service.

Frank I. Carter urged that Lowell should pay its part of the upkeep of Tewksbury lines, as the exchange centers at Lowell. The mileage charge is dead wrong for one community where it is not applied to another, he said.

Harry Betz, representative of the American Sugar Refining Co. at Tewksbury, said that including the mileage charge, a residence telephone now costs him $11.50 a month against $2.50 at Lowell, and a business telephone $16.50 a month at Tewksbury against $7 at Lowell. In outgoing calls he pays the company $75 to $125 a month for service. As many of his customers reverse charges, his total telephone bill averages about $300 a month.

H. L. Farmer, a funeral director, described the drawbacks of trying to do business without a business listing. He contended that the rate makes it too costly for him to have a business station listing and that he is now operating on a two-party line at a rate of $7 per month.

At Ayer, Mass., he has a branch office where he pays $4.20 a month for a private line, and the service and prices of the same company are satisfactory in every way. Unless outsiders calling for undertaking service know his business, it is hard for them to reach him on the wire without a business listing. Franklin F. Spaulding favored lower rates on the ground that the company would sell more service under such conditions.

Edward Walsh, superintendent of streets at Tewksbury, declared that the advent of chain stores has given such towns the same prices for standard commodities as prevail in large cities, and that electric light and power rates have gone down in the past five years. He felt that telephone rates should be lowered to correspond. Party line business service is not very satisfactory, the witness said.

Another witness testified that on a 15-party rural line a physician was obliged to leave his office and go to see a patient in making hospital arrangements, whereas if he had been able to get the line without an evening's trying, pre-hospitalization would have all been arranged by wire.

Governor's Committeeman Enters

Elliott Earl, a member and secretary of the public utilities advisory committee maintained by Gov. James M. Curley of Massachusetts, stated that the committee had received a complaint from the Carter organization against the telephone company and intimating that the commission had failed to show sufficient interest in the case. It was pointed out that the street lighting pole line, built to enable the Lowell power utility to serve Tewksbury better, is an asset to the telephone company.

It appeared that an inspector had

been sent to Tewksbury to see the complainant on behalf of the commission. W. B. Carter criticized the inspector for visiting Tewksbury in a telephone company car and in conjunction with a representative of the communication organization, but this aspect of the matter fell flat.

Mr. Earl said that apparently in the Tewksbury case both quality and quantity of service as well as rates were in question, and that in his opinion the company had seen fit to exploit the town, thinking possibly that too few citizens would take the trouble to go to Boston to attend a hearing.

The speaker raised the point that possibly the case might be one for federal jurisdiction. He asserted that as the securities of the New England company, a New York corporation, had never been passed upon by the Massachusets commission, it would be difficult to pass on the rates without knowing about the securities. Mr. Earl charged the company with blocking the governor's committee when it sought detailed information about its securities in Massachusetts.

Acting Chairman Wells vigorously defended the commission from charges of lack of interest and read from records showing the board's reponse in sending an inspector to the disputed area soon after receiving complaints. Mr. Earl demanded that the inspector be called into the hearing room and placed on the stand, but Chairman Wells refused on the ground that it would delay the progress of the case. Mr. Earl then hurriedly left the room without waiting to hear the company's rebuttal.

Company Replies to Petitioners

Charles S. Pierce, vice-president and general counsel of the company, appeared for the respondent, admitting at the outset that the mileage distances involved in relation to Lowell and adjacent towns present a difficult problem. The company has been unable to find an answer to this case without breaking down the system on which telephone rates are based.

There must be limits set to the calling area of any telephone customer. Therefore, the system of rate-making has involved dividing up the territory into exchanges. In determining exchange limits the company has used its best judgment as to where the community of interest of the public lies. This is not done arbitrarily. The community of interest of Tewksbury subscribers lies in the Lowell exchange. For over 20 years Lowell has included this district.

Mr. Pierce said that it is possible that the local population might like to consider the establishment of a Tewksbury exchange with toll charges to Lowell. The base rate would be much lower in that case, but of course the toll charges would have to be applied to in and out calls between the two places. Telephone rates are and must be based on average conditions, the speaker said.

In general, base rate areas are reasonably thickly settled and fairly contiguous to the central office serving them. Original base rate areas were largely defined by radial lines. In 1925, when the whole New England company's rate schedule in Massachusetts was revamped, irregular base rate areas were prepared; circular approximations were generally abandoned and lines redrawn to include when feasible these smaller communities whose development was contiguous to the central office.

The base rate area surrounding Lowell in 1925 was practically circular. It included Tewksbury and some mileage was paid by virtually everyone in that town. Part of Dracut was also included. Since then the base rate area at Lowell has been extended to include Chelmsford and North Chelmsford. From

The Operators' Corner

By MRS. MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

THE MOST valuable influence of a vacation is realized from a complete change of environment and the ability to relax and play. Series No. 203

VACATION TIME is here again which recalls a saying of "Poor Richard" of almanac fame that he could do a year's work in 11 months, but he could not possibly do it in 12. This very aptly expresses the mental attitude of the average worker today.

The annual vacation is intrinsically valuable and a necessary factor in the health and progress of the individual. A change from the regular routine of living is beneficial from many standpoints.

At the present time the writer is anticipating a restful vacation, in the near future, away from the daily routine of living by the alarm clock; sleeping until disposed to arise, going to places of amusement, feeling free to stay up until a late hour, knowing that there will be ample time for rest on the morrow.

The most valuable influence of a vacation is realized from a complete change of scenery regardless of the distance necessary to provide the new environment. A vacation should be both a mental and physical stimulant. We should look forward to a vacation with high spirits and plan ahead just what we propose to do with a week or two or a month. Wipe the slate clean of cares and worries and routine interests and plan to play, for play is what a vacation should be, every time, if it is to be a real balance wheel in the yearly activities.

Go back to your childhood days and get some real pointers on vacations. Remember, long before school was out you were looking forward to summer with keen anticipation. And when the happy day came, and the last bell was rung, and you were dismissed for the season, books were put aside and you made a grand rush for the open air and the sunshine, the playground, the swimming pool and many other attractions.

Regardless of our station in life or what our responsibilities may be, after all, we are just grown-up boys and girls. So put aside your dignity and enter into the vacation spirit. You will return to your daily routine duties, better-equipped, rested mentally and physically, ready and willing to take up your responsibilities until the vacation bell rings again next year.

Questions from Illinois Operators

1. If you receive an NC report from an intermediate operator, should you immediately leave a Call Order?
2. Can a long distance call be accepted from any telephone?
3. How can we handle complaints from subscribers that others use their telephone when they will not object to the users but expect us to do something about it?
4. When an operator from a smaller exchange calls a paystation collect, to Freeport, for example, why does the operator say "Postpay"?
5. Can a person-to-person CLR call from a postpay coin box be completed without splitting the connection?

For the answers to these traffic questions, please turn to page 28.

British Competition for "Golden Voice" Telephone Operator

THE final trial in the Golden Voice competition conducted last month by the British Post Office (TELEPHONY of May 25, June 8, and 29), was a severe one for the girls. They learned from their instructions that the judges demanded that "the voice must be beautiful in quality. It must have a fullness of tone, with nothing niggardly about it and nothing rasping in the breathing or in the note. The speech must be impersonal. It should be as detached as the voice of a bird, without trace of over-emphasis or personal advertisement. It should be without any trace whatever of the theatrical."

Other stipulations were that the speech must be clear and free from accent, urban or provincial.

Nine girl operators selected from over 15,000 in exchanges throughout Great Britain, met in the King George V. Hall of the Central Telegraph Office, London, for the last stage of a contest which made telephonists "voice conscious" and which aroused great interest and local rivalry.

Four of the nine were from London exchanges and the others came from Guildford, South Shields, Birmingham, Exeter, and Blackpool.

A panel of judges consisted of John Masefield (the Poet Laureate), Dame Sybil Thorndike, Lord Iliffe, S. Hibberd (chief announcer of the B.B.C.), and Mrs. E. D. Atkinson, of Burnley-in-Wharfedale, who had been chosen by ballot as the "perfect telephone subscriber."

The judges did not see the competitors until their task was completed, but, seated together at a table, listened through gilded hand-microphones to test passages read by the operators.

The candidates balloted for the order in which they were to go to the microphone, and then in turn they repeated the test passages put before them. First, they were required to read some 30 lines of a passage from Milton's "L'Allegro," beginning:

Mirth, admit me of thy crew.
To live with her, and live with thee,
In unreproved pleasure free;
To hear the lark begin his flight;
And singing startle the dull night,
From his watch-tower in the skies. . .

This was followed by a short extract from R. L. Stevenson's "Treasure Island" and a strictly practical test made up of such sentences as "At the third stroke it will be one twenty four and fifty seconds."

At the end of the trial the competitors met the judges and Mr. Masefield announced the result. Miss Ethel W. Cain, who was placed first, has been a telephone operator for five years, and has worked in the Croydon and Victoria Exchanges. Her home is in Mitcham Road, West Croydon.

After being congratulated she admitted that 26 was a good guess concerning her age, and said that she had taken part in amateur theatricals and studied elocution. Mr. Masefield made the comment that she had a golden voice. "It is beautiful," he said.

Second place in the competition was taken by Miss I. H. Dunn, of the Trunk Exchange, London.

Judges in the local competitions paid high tribute to the clearness of diction and the charm of the voices of the telephone operators and asked that the poetry and prose of English classics be included as part of the tests.

In addition to the lessons in speaking correctly which the British Post Office insists that every candidate for the position of telephonist shall take, many of the girls continue their training in elocution.

The competition, which was originally intended for the purpose of selecting a golden voice to tell the time to telephone users, acquired a wider significance by the attention which it called to the importance of clear speaking and of beauty in the spoken word. Several of the contestants took part in broadcast programs.

Telephone operators in all exchanges throughout England also participated in the search for a woman representative of the perfect telephone subscriber to act as one of the judges. In a ballot Mrs. E. D. Atkinson was selected. She is shown in the accompanying illustration with Miss Cain, the winner of the Golden Voice competition.

Miss Ethel W. Cain (Left), Winner of the "Golden Voice" Contest Recently Conducted by the British Post Office, Being Congratulated by Mrs. E. D. Atkinson, the "Perfect Subscriber." The Latter Also Acted as One of the Judges in the Contest for the Telephone Operator Having the Sweetest and Most Musical Voice.

• • •

Recent Prices in the Metal Market

New York, N. Y., July 22: Copper—Quiet; electrolytic spot and future, 8c per lb.; export, 7.80@7.85c. Tin, firmer; spot and nearby, 52.75@52.87c per lb.; future, 52c. Iron—Quiet; No. 2, f. o. b. eastern Pennsylvania, $19.50 per ton; Buffalo, $18.50; Alabama, $14.50. Lead—Steady; spot New York, 4.15@4.20c per lb.; Eastern St. Louis, 4c. Zinc—Dull; East St. Louis spot and future, 4.30c per lb. Aluminum—19@22c per lb. Antimony—Spot, 12.75c per lb. Quicksilver—$71.50@73.50 per flask of 76 lbs. Wolframite—15c per lb.

Lowell to Chelmsford the residential and business telephone development is pretty continuous, and thus it is reasonable to charge for service without mileage in this section.

It has seemed to the telephone company that the Tewksbury conditions were entirely different. Every difference in tariff constitutes a discrimination, to be sure, but the question is whether an unreasonable discrimination exists. The Tewksbury territory is so much more thinly and unevenly settled that it seems fair to include the mileage charge. There are about 230 subscribers in Tewksbury and 16,000 in Lowell.

Mr. Pierce said that if the company is required to include Tewksbury in the Lowell base rate area without mileage, it will break up the whole system of base rate areas as applied in the state. What makes the petitioner's complaint acute is the lack of fitness of a multi-party line for service to business subscribers of the company.

The company has tried to reduce the number of subscribers on lines run into the country and eight parties are now set as the desirable maximum. Curiosity listening is a great handicap on multi-party lines, especially in rural areas. Mileage has now been abandoned on eight-party rural lines in Massachusetts. The hearing was then concluded.

New Stromberg-Carlson Central Office Equipment At Corning, Iowa

By G. WALLINGTON

A COMPLETE new switchboard installation was recently cut into service in the exchange of the Western Telephone Corp. at Corning, Adams county, Iowa. The cut-over was made without the least interruption to service under the direction of C. H. Smith of Oklahoma City, Okla. The new equipment was manufactured and installed by the Stromberg-Carlson Telephone Mfg. Co., of Rochester, N. Y. It replaced an old model Stromberg-Carlson equipment installed 30 years ago and in constant service since that time.

Several of the new board of officials of the Western Telephone Corp. and other out-of-town visitors were present at the cut-over, including the following:

General Manager J. B. Haley and Assistant General Manager F. M. Browne of Kansas City, Kans.; H. T. McCaig, assistant manager of the Chicago division of the Stromberg-Carlson company; W. J. Pfaender, Iowa representative for Stromberg-Carlson; C. F. Saunders of the Stromberg-Carlson company.

W. Naylor, district superintendent of the Western Telephone Corp. of Denison, Iowa; W. H. Fowler, president of the Fowler Telephone Co. of Pella, Iowa; G. E. Atkinson and Guy Frymire of the Creston Mutual Telephone Co. of Creston, Iowa.

"Open house" was conducted recently at the new Corning exchange to afford the public an opportunity to inspect the new facilities. In commenting upon this formal opening, the Adams County Free Press said:

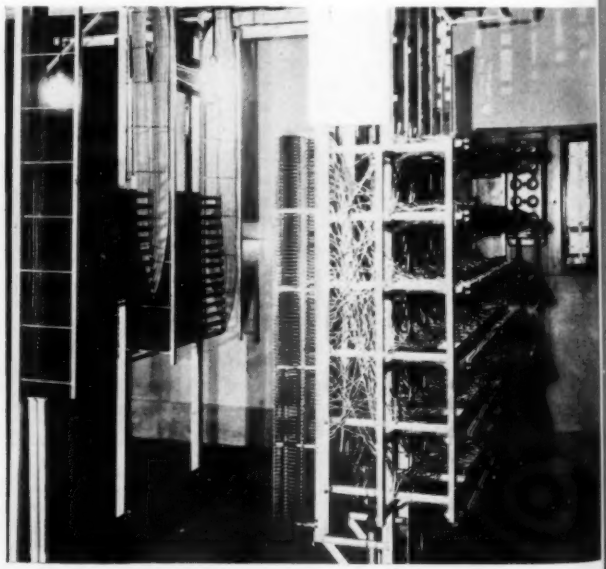
"The formal opening of the new Corning exchange of the Western Telephone Co. was an interesting event of last Saturday and during the day hundreds of people visited the new exchange where obliging employes of the company explained the operation of the new switchboard and other equipment."

In addition to the "open house" for the public, the company commemorated the occasion with a supper and dance for the employes in the Corning and Denison districts, including 13 western Iowa towns. Several officials of the company from Kansas City were also present for the opening and remained for the evening festivities.

The new equipment comprises a Stromberg-Carlson three-position multiple switchboard with two positions equipped. It has 500 common battery local lines, 43 rural lines and 13 toll lines. It is equipped with universal feature cord circuits.

All numbers on the telephones of mem

A Large Part of the Switching in This New Type Power Board, Recently Installed at Corning, Iowa, Is Done by Means of Relays, Accessible from Front of Board.



This Stromberg-Carlson Three-Position Multiple Board, Recently Installed in the Corning, Iowa, Exchange of the Western Telephone Corp., Is Equipped to Serve 500 Common Battery Local Lines, 43 Rural Lines and 13 Toll Lines.—Relay Racks in Corning Exchange

bers of the Corning volunteer fire department are equipped with red lights on the new board. After a fire alarm sounds, the operators have strict instructions to answer the red flashes prior to all others. This will preclude any delay when firemen call the exchange to learn the location of the fire.

Eventually the board will be equipped with a special panel so arranged that all 25 members of the fire department may be summoned by the operator plugging one number and giving the location of the fire to all of the firemen simultaneously. This will allow a still alarm to be turned in if necessary, eliminating the necessity of blowing the siren with the resultant interference of street traffice.

The new central office installation includes a new type power board in which a large part of the switching is done by means of relays. These relays are mounted on the power board and accessible from the front of the board, as shown in the accompanying illustration.

Power wiring is also terminated on terminal strips on the rear of the board, making for easy installation. The board has a Monson-Maine slate panel.

The new Corning exchange is located in the former Hogan Bank building

COMING CONVENTIONS

United States Independent Telephone Association, Tower Room, Stevens Hotel, Chicago, October 8, 9, 10 and 11.

Independent Pioneer Telephone Association of the United States, Stevens Hotel, Chicago, October 10; Annual Luncheon.

The Illinois Telephone Association, Hotel Pere Marquette, Peoria, November 14 and 15.

Obituaries of Telephone Men

BENJAMIN STALKER READ, of Atlanta, Ga., president of the Southern Bell Telphone & Telegraph Co. since 1924—formerly operating vice-president of the Southwestern Bell Telephone Co. and later president of the Mountain States Telephone & Telegraph Co.—died on July 23 at his home in Atlanta after a brief illness. He was 59 years old.

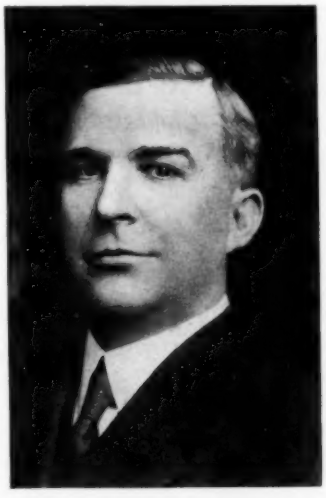
Through unusual perseverence and hard work since he first entered the telephone business when a mere boy at the age of 13, Mr. Read gained a reputation as one of the outstanding operating telephone executives of the country.

Born on January 21, 1876, he secured a job as messenger boy in the office of the Cumberland Telephone & Telegraph Co. at Carthage, Tenn., on his 13th birthday. In time he advanced to local manager of the Carthage exchange and was then transferred to the company's general offices at Nashville. He served as local manager in turn at Owensboro, Ky., Chattanooga, Tenn., and New Orleans.

His work at New Orleans led to his appointment as division superintendent for Mississippi and Louisiana, and in March, 1912, he was promoted to St. Louis, Mo., as general manager of the old Bell Telephone Co. of Missouri. In November of that year he was sent to Kansas City as general manager of the Missouri & Kansas Telephone Co. and early in 1914 he returned to St. Louis as operating head of the Southwestern group of Bell companies.

Mr. Read became second vice-president of the Southwestern Bell Telephone System in May, 1914, and soon after, operating vice-president. When the government took over control of the telephone lines and systems of the United States in 1918, Ben S. Read was among those appointed on January 8, 1919, to operate the Bell System lines under the direction of the operating board of the United States Telegraph & Telephone Administration. He was placed in charge of rate plans and miscellaneous commercial matters.

Following this work, he was elected president of the Mountain States Telephone & Telegraph Co. in the spring of 1919, with headquarters at Denver, Colo. In 1924 he was named president of the Southern Bell Telephone & Telegraph Co., which position he occupied until his death.



BEN S. READ, of Atlanta, Ga., President of the Southern Bell Telephone & Telegraph Co. and Well Known as a Capable Operating Telephone Executive, Passed Away on July 23 After a Brief Illness.

Mr. Read climbed steadily to succees through persistent determination and demonstration of ability, attaining an unusually wide telephone experience. Hard work and earnest effort brought well-earned promotions throughout his career.

Mr. Read was known to have been especially fond of the South and its traditions and people. He spent about two-thirds of his "telephone life" in the South, in addition to having been born there.

His many friends throughout the telephone field will regret to learn of his passing, and will long remember pleasant contacts with him.

▲

WILLIAM McLAUGHLIN, Aberdeen, S. D., construction superintendent of the Dakota Central Telephone Co., died suddenly on Sunday, June 23, from a heart attack at the age of 56. Associated with telephone companies in Iowa and South Dakota for 36 years, Mr. McLaughlin became acquainted with a great many telephone men, who will regret to learn of his passing.

Mr. McLaughlin was born at Atlantic, Iowa, on December 10, 1879. He entered the telephone business in the employ of the Iowa Bell Telephone Co. in 1899. He later became associated with the Western Electric Telephone Co. of Iowa, and in April, 1910, went to South Dakota to work for the Dakota Central company in Aberdeen, where he has since lived.

Mr. McLaughlin is survived by a son, a daughter, a step-son, a brother and a sister, his wife having preceded him in death in 1933.

The funeral services on June 26 were attended by members of the Elks lodge and 175 employes and out-of-town representatives of the Dakota Central Telephone Co., with fellow telephone workers acting as pallbearers.

SOW IDEAS . . .

It's an old selling axiom that the quickest way to turn prospects into customers is to show them how they can profit by the use of your product. Telephone advertising in national farm papers is planned on just that principle. • A typical advertisement appears on the opposite page. It lists a variety of actual instances in which farmers have used telephone service to definite, dollars-and-cents advantage. Simila advertisements feature the social and emergency values of th farm telephone. • This advertising is planting telephone ide far and wide. The entire industry should share in the harv

REAP CUSTOMERS

HOW THEY USE THE TELEPHONE

A KANSAS farmer has wheat to sell. He telephones Kansas City for prices.

An Iowa farmer who sells his hogs in Chicago calls to find out the price before he ships, that way avoiding a weak market.

A farm woman near Columbia, Missouri, sells dressed chickens by telephone. She finds it an easy way to locate customers.

A Kentucky farmer needs the help of a neighbor in the hayfield. He uses the telephone. It saves him a trip.

Innumerable are the ways the telephone makes itself useful every day on the farm. It helps find the market where you can sell to best advantage. It sends the word around when there is something doing in the community. It is always ready to summon the doctor or veterinarian in time of emergency. Its value on the farm can hardly be measured in dollars and cents.

BELL TELEPHONE SYSTEM

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

Activities of Commissions and Courts

FCC Defense Problem in International Traffic

Is it good national policy for all telephone service between the United States and France to pass through British territory?

France thinks not, according to the United States News.

At present, the radio-telephone system between the United States and France passes over lines of the American Telephone & Telegraph Co. and its hook-up with the British Post Office telephone system.

France has asked the U. S. Department of State for its moral support in a movement for a direct service between the United States and France. The State Department passed the matter up to the Federal Communications Commission and that body is soon to have a hearing on it.

Strategically, a time might occur when it would be embarrassing for all French telephone messages to this country to go through its powerful neighbor's territory. So a game of strategy, in the background, is on between France and the British over this question.

On July 11 the FCC, in a brief, simple announcement, reported the A. T. & T. had filed a new tariff, effective July 16, which the FCC summarized as follows:

"Announces that France, reached via New York-London ocean link, has been placed in foreign zone No. 1, which will result in a reduction in the rate from New York to that country."

So today it costs less to telephone from the United States to France, via London, than to telephone to the Irish Free State, according to the United States News.

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Direct Testimony Completed in Wisconsin Bell Case

Direct testimony in the four-year-old Wisconsin Telephone Co. rate investigation by the state public service commission was completed late on July 18 in Madison before Commissioners A. R. McDonald and Fred S. Hunt.

Except for cross-examination of company witnesses by Alvin C. Reis, commission chief counsel, rebuttal testimony by both the company and the commission staff, and oral arguments by attorneys on legal points, the case is ready to be submitted to the commission for final decision.

To permit the commission staff to prepare for cross-examination of company witnesses, including officials of the American Telephone & Telegraph Co., and of the Western Electric Co., further hearings will be adjourned to September. A. R. Colbert, commission chief accountant, left for New York City on July 17 to make a detailed study of A. T. & T. Co. books as they affect the Wisconsin company.

At the end of direct testimony on July 18, the commission had before it two markedly contrasting pictures. The company urged a rate base of $54,000,000 or $24,000,000 more than the $30,000,000 base recommended by the commission staff.

To reproduce the company's property used to give local telephone service in 96 cities and villages under present-day conditions would cost $57,000,000, the company claimed, while the commission staff contended it could be done for $42,000,000. That accounts for $15,000,000 of the $24,000,000 difference between the company and commission staff rate bases.

Another $6,000,000 difference is found in deductions made from the cost of reproducing the property today to cover the extent to which the company's property is depreciated. The company deducted $6,000,000, while the commission staff deducted $12,000,000.

The remaining $3,000,000 of difference is in the company's claim that if it were starting up today it would need virtually that amount to train personnel, get customers, issue the first directory, and do advertising.

No allowance for this item is made by the commission staff on the ground that customers have already paid for this cost through rates they have paid in the past and that, therefore, to permit inclusion of the $3,000,000 in the rate base would let the company earn a return on customer contributions and in effect, over a period of years, get paid twice for the expense.

Another contrasting element in the picture is the company's claim that the property is in 90.3 per cent condition as compared with 100 per cent brand new, while the commission staff says it is 71.64 per cent of new.

Items making up the $15,000,000 difference in cost of reproducing the plant new include at least $4,000,000 thrown out of the rate base by the commission staff as unused and excess property, $500,000 more allowance by the company than the commission for errors and omissions in the appraisal, while the balance is due to a difference in allowances for cost of materials, labor, and interest on loans that would be necessary in a reproduction of the property.

Chief Engineer George F. Crowell of the Wisconsin company was the company's witness on July 17. He was nearly $6,000,000 lower than the $11,800,000, or 28 per cent, depreciation determined by the commission staff. The staff computation was based on

Answers to the Traffic Questions on Page 22

1. If you encounter NC on the first route and you have an alternate route and have not previously tried the alternate route, do not leave a call order but say, "Right," clear the toll circuit and try the alternate route. If you encounter NC on the first route under any other condition, leave a call order immediately.
2. In offices where the standard operating practice is in use, toll calls may be accepted from any telephone. In offices where barred toll service is in effect, long distance calls cannot be accepted from these lines. Although a call might be placed collect from one of these stations, a report charge might be incurred which could not be charged to a telephone barred from toll service,
3. Complaints of this nature should be referred to the commercial department or to the manager.
4. When an order is received for a number preceded by the word "Collect," if the called number is a coin-box station, the distant operator will say, "Prepay" or "Postpay" to let you know the type of station called. In this case the ticket must be passed to the TTC so that she may collect the amount of the charge.
5. Yes.

valuation of the company at $42,000,000, while the company's was based on its valuation at $60,000,000.

Mr. Crowell explained that the company figured depreciation on the basis of plant inspection. The commission staff based its determination on age of equipment and its durability as indicated by previous experience.

• • •

Wisconsin Commission Studies Handset Charges

Because eight Wisconsin telephone companies have failed to comply with a general order of the Wisconsin Public Service Commission, reducing and standardizing charges for handset telephones, the commission announced on July 19 that it would make a study of their books at the expense of the utilities and hold another hearing at Madison on July 30.

At a previous hearing these eight companies contended they could not establish rates to comply with the order, which gave the alternative to companies of an eight-cent monthly additional charge for handset telephones or a 25-cent charge for two years.

These companies are the Commonwealth Telephone Co., Madison, with more than 100 exchanges; North West Telephone Co., Tomah, with approximately 20 exchanges; United Telephine Co.; Peoples Telephone Co., Columbia county; Monroe County Telephone Co.; Mount Horeb Telephone Co.; Mondovi Telephone Co.; and Platteville, Rewey & Ellenboro Telephone Co.

Conferences with representatives of some of these companies, held by the commission staff, have not resulted in any change in their handset rates.

All other companies that provide handset service, except the Wisconsin Telephone Co., have complied with the commission's general order. The Wisconsin Telephone Co.'s charges were covered by an individual order reducing its rate from 25 to 8 cents monthly.

• • •

Telephone Company Ousted at Lebanon, Mo.

The Missouri Supreme Court has ordered the ouster of the Missouri Standard Telephone Co. from Lebanon, Mo. The company's franchise expired December 11, 1932.

The court, in its opinion, held in general that the company's "right to use the streets and alleys of Lebanon for the maintenance of its telephone poles and wires ceased when its franchise expired."

After the expiration of the company's franchise, the Lebanon board of aldermen, on November 6, 1933, granted a 10-year franchise to "a group of Lebanon citizens" to construct and maintain a telephone system to replace the Standard company. The grantees of the franchise, however, have taken no steps to install the new system, the opinion points out.

• • •

Associated Telephone Reorganization Advanced

Assets of the Associated Telephone Utilities Co. have been transferred to General Telephone Corp., a new company, and its new subsidiary, General Telephone Allied Corp., according to the plan of reorganization of Associated Telephone Utilities Co. approved by Federal Judge Alfred C. Coxe of New York.

William J. Wardall, who has been the trustee in the reorganization of the old company, will act as president of General Telephone Corp. until a decision is made on the permanent management by the stockholders at their first meeting, scheduled for early autumn.

• • •

Commission Rulings and Schedule of Hearings

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C.

July 10: Brief filed by the Pacific Telephone & Telegraph Co. urging the FCC to uphold the present classification of telegraph messages and the present rate basis. The company made specific objection to the proposal of Postal Telegraph & Cable Corp. that through rates from the Pacific company's territory to the East should be set by the commission.

July 10: Detroit & Cleveland Navigation Co. granted special permission to establish wireless telephone service and charges therefor between its steamer "Greater Detroit," now operating between Detroit and Buffalo, and the land station of the Lorain County Radio Corp., Lorain, Ohio, effective on one day's notice to commission. This action was taken on June 20 and ratified by the telephone division of the commission on July 10.

July 10: Platte Valley Telephone Corp., Scotts Bluff, Neb., granted special permission to advance from 8:30 to 7 p. m. the application of night point-to-point message toll rates, and to cancel evening rates at present applicable from 7 to 8:30 p. m., effective on one day's notice to the commission. (Action was taken on July 2 and ratified by the telephon division on July 10.)

July 10: Oregon-Washington Telephone Co., Hood River, Ore., granted special permission to advance from 8:30 to 7 p. m. the application of interstate evening rates, and waived the 30-day notice required under sec. 203 (b) of the act. (Action taken June 26 and ratified by telephone division on July 10.)

July 11: Telephone tariff, revised page to FCC No. 4 filed by American Telephone & Telegraph Co., effective July 16. Announces that France, reached via New York-London ocean link, has been placed in foreign zone

EASY
TO CARRY
SIMPLE
TO INSTALL

- Why is the TWIN-SIX so popular among linemen? *Because it is easy to carry*—only half as many batteries required, square shape instead of round, 40% less weight than two No. 6's, 30% less bulk. *Because it is simple to install*—only two connections instead of four. Once a lineman has used the TWIN-SIX he is sold on it.
- Improve the efficiency of your linemen by using the TWIN-SIX. Its strong EVEN talking current will please your subscribers too.
- Priced at only 39¢ each (47¢ west of Rockies), terms 5% 10 days, net 30. Shipment prepaid on orders of 30 or more. Order now from Inland Equipment Co.

BURGESS
TWIN-SIX
TELEPHONE BATTERY
INLAND EQUIPMENT CO., (Distributors)
MAX F. HOSEA, President, INDIANAPOLIS, IND.

The noise test circuit is shown in Fig. 2. The induction coil is a special type having twice the usual number of turns on its secondary and is intended to make the test more sensitive. The test is made by listening in the receiver while gently shaking or moving the cord. A scratching or

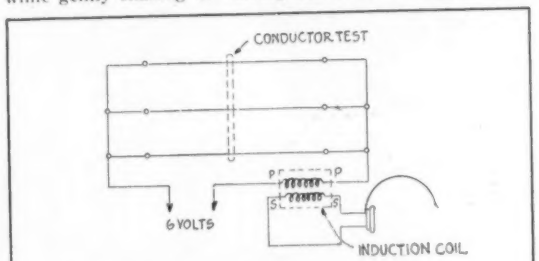


FIG. 2. CIRCUIT USED IN MAKING NOISE TESTS.

scraping sound indicates a noisy condition of the cord under test.

The two circuits are shown combined in Fig. 3. To prevent one circuit from interfering with the other while making the tests, two keys are introduced into the circuit and utilized to cut one or the other test circuit out when either the continuity or noise test is desired. It will be noted that provision is made for closing the secondary of the listening circuit *after* connecting the primary, or opening the former *before* opening the latter. This is necessary to prevent painfully loud clicks in the receiver occurring on operating the listening keys.

Construction of the Cord Test Set

The construction of the test set is quite a simple matter. All that is needed are switchboard lamps of the proper ratings, push-type keys or push-buttons and a suitable source of current for the continuity test; induction coil, receiver cord jack, a test receiver, and batteries for the noise test; and finally a box or cabinet in which to mount the equipment. Jacks and terminals should also be provided to connect the cords under test to the testing circuits. Fig. 4 illustrates a typical construction of the cord test unit which may be modified to suit the requirements of the small company repair shop.

Three lamps and push-type keys are provided, one for each conductor of the cord under test. It will be noted that the push-type keys are located just under the lamps. This is to insure each key being identified with its lamp in the continuity, short-circuit, and crossed-conductor tests.

The lamps and keys are further identified with the conductors of the cord by the designations, *Y*, *R* and *S*, stand-

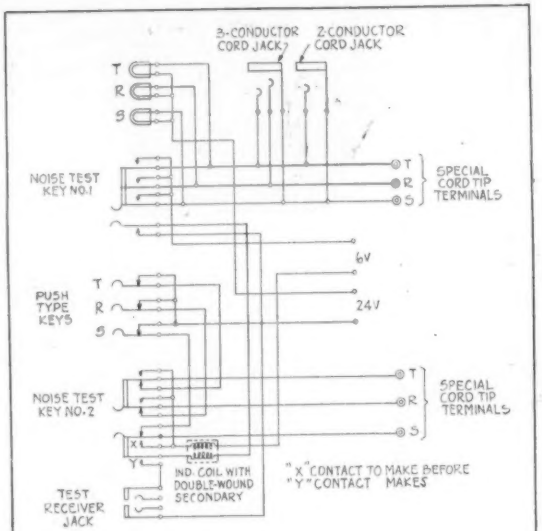


FIG. 3. WIRING DIAGRAM OF CORD TEST SET CIRCUIT.

sired, colored lamp caps may be employed to distinguish the conductors: white to indicate tip; red, sleeve; and, blue or some other suitable color for the ring conductor.

In magneto exchanges having no direct current supply, six-volt switchboard lamps may be used with a storage battery, or a number of dry cells may be connected in series-multiple for the current source. Flashlight lamps with a suitable battery source may be resorted to if necessary, and

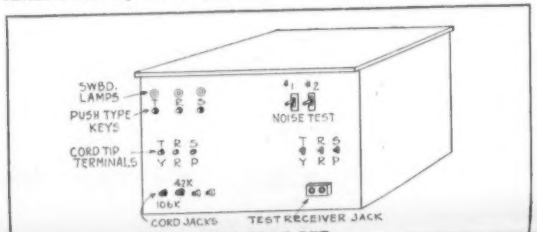


FIG. 4. CORD TEST SET.

the battery installed in the test cabinet to provide a portable set for use around the shop.

Terminals of a special type illustrated in Fig. 5, are necessary to insure good contact with the cord terminals, especially when making the noise test. Two sets of these terminals are used for connecting instrument cords, one set each located at opposite ends of the cabinet panel.

Each terminal is identified with the conductors of the cord under test by the designations, *Y*, *R*, and *P* (yellow, red, and plain) to correspond with the colors of the conductors of instrument cords. For cords having pin-type terminals instead of the spade type, radio pin jacks may be utilized just under the special terminals on the cabinet.

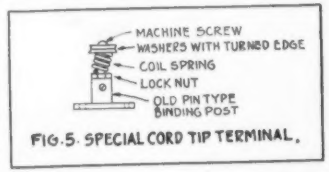


FIG. 5. SPECIAL CORD TIP TERMINAL.

For testing switchboard cords, jacks corresponding to the type of plugs used on the cords are used on one end of the cabinet panel and connected in multiple with one set of the special terminals just described. If more than one jack is required to take care of other types of plugs, more jacks should be installed and connected in multiple with the first.

For two-conductor switchboard cords, two-conductor jacks are required. The only difference in the continuity test that would result from their use is that the ring conductor lamp would be rendered inoperative, owing to no path being provided for it through the cord.

For switching from the continuity test circuit to the noise test circuit, two keys are provided as shown in Fig. 4.

Operation of the Cord Test Unit

The method of operation of the cord test unit is quite simple and has already been described in the data sheet section on circuit elements. Switchboard cords are plugged into the proper jack and its terminals are connected to the special terminals on the opposite end of the cabinet panel; care being taken to see that the connections are properly made.

Instrument cords are connected to the respective terminals on the panel and tested merely for continuity and noise, since it is obviously immaterial if the conductors happen to be reversed in connecting this type of cord. Switches from the continuity test to the noise test and vice-versa are easily made without disconnecting the cord, merely by operating the noise test keys.

A word of caution is necessary in regard to the batteries used in the noise test circuit. The battery should not be allowed to run down so the sensitivity of the test is affected. It should be tested at regular intervals and defective cells

No. 1, which will result in a reduction in the rate from New York to that country.

July 12: American Telephone & Telegraph Co. filed application for authority to withdraw, on one day's notice, the published charges (which became effective on July 12, 1935) applicable to overseas telephone service from the United States to the Dominician Republic.

July 13: Mountain States Telephone & Telegraph Co. filed revised pages to FCC No. 2, effective July 19. Announces rates from certain points to Port Entry No. 44, Kans., and Nelson Road Camp, Idaho, new telephone stations. Also announces a change in name for each of the following telephone toll stations: Austin, Idaho, to Austin Ranch; Gronewald, Idaho, to Gronewald Ranch; and Winschells, Idaho, to Winschell.

July 13: The Pacific Telephone & Telegraph Co. filed revised pages to F. C. C. No. 1. Announces charges for local channels used in connection with program transmission at Everett, Wash., a new service point, effective July 22, 1935. Announces that Guthrie Camp No. 35, Guthrie Camp No. 42, and Stronghold, Calif., are to be discontinued as telephone toll stations, effective August 17, 1935. Also announces that the name of the telephone station, Liskey Bros. Ranch, Calif., has been changed to Liskey; and that Trask Camp P-217, Oregon, is to be established as a telephone station, effective July 29, 1935.

July 15: The Pacific Telephone & Telegraph Co. filed revised pages to F. C. C. No. 1. Announces the discontinuance of Acres, Government Road Camp B, and Long Beach East, British Columbia, as telephone toll stations, on the lines of the British Columbia Telephone Co., effective August 19, 1935. Also announces various new telephone toll stations on the lines of the British Columbia Telephone Co., effective July 23, 1935.

July 15: The Ohio Bell Telephone Co. filed original and revised pages to F. C. C. No. 2, effective August 15, 1935. Announces discontinuance of rates between certain points in Ohio and various points in Indiana, Kentucky, Pennsylvania and West Virginia. Announces that Bladen and Carington, Ohio, are to be established as new telephone toll stations. Announces rates from points in Ohio to new points in West Virginia. Also announces the discontinuance of the toll station Johnston, Ohio, canceling the rates from that point to various points in Pennsylvania.

July 16: The Pacific Telephone & Telegraph Co. filed revised telephone tariff pages to FCC No. 1, effective July 25. Announces Coit, Calif., as a new telephone station; that Tillamook, Ore., is to be the toll center for Trask Camp P-217, Ore., instead of Tillamook and Portland, Ore.; also that Elvigans Landing, Wash., has been designated as a seasonal toll station.

July 17: The Chesapeake & Potomac Telephone Co. of West Virginia filed revised telephone tariff pages to FCC No. 2, effective July 22. Announces rates from certain points in West Virginia to Bladen, Ohio, a re-established telephone toll station.

July 17: The telephone division granted the Lorain County Radio Corp., Lorain, Ohio, renewal of licenses for special experimental stations; freqs. 2118, 2158, 2182, 2738 kc; watts, for a period of three months.

July 17: The telephone division granted the Bell Telephone Laboratories, Inc., Ocean Township, N. J., renewal of special experimental station license for experimental service, effective July 30 to expire October 30, 1935, in exact accordance with existing license.

July 17: The telephone division ratified action taken July 16, granting special permission to the American Telephone & Telegraph Co. to withdraw the published charges applicable to overseas telephone service to the Dominican Republic, which became effective July 12, on one day's notice to the commission.

July 18: Inter-Mountain Telephone Co., Bristol, Tenn., filed application asking authority to construct a standard .104 copper toll line between Wytheville and Bland, Va.

Illinois

July 23: Hearing in Chicago on complaint of Dr. Jacob Stern against Illinois Bell Telephone Co. relative to telephone charges to complainant in the city of Chicago.

June 25: Hearing in Chicago on the commission's own citation against the Forest City Telephone Co. and the Iroquois County Telephone Co. concerning their failure to furnish annual reports for the years 1932, 1933 and 1934 and to show cause why they should not be prosecuted under penalty provisions of an act approved June 29, 1921.

June 25: Hearing in Chicago on commission's own citation against the Worden Telephone Co. in its failure to furnish annual report for the year 1934 and to show cause why it should not be prosecuted under the penalty provisions of an act approved June 29, 1921.

Minnesota

July 29: Hearing in Kasota on application of the Nicollet County Telephone & Telegraph Co. to consolidate the Kasota exchange area with the St. Peter exchange area and render service from the central office in St. Peter, and to place in effect certain rates and charges.

Missouri

July 12: Approval granted the sale and transfer by R. B. Caldwell, trustee, to Arthur Rice of telephone property and systems at Ironton, Arcadia and Pilot Knob.

July 12: Approval granted joint application for permission to transfer the telephone properties at Taskee, Greenville, Piedmont and Williamsville from the North Central Telephone Co. to Dee A. Rice.

Wisconsin

July 18: Presentation concluded of direct testimony by company in Wisconsin Telephone Co. statewide rate case. Hearing adjourned to September, at which time cross-examination of company witnesses including officials of the A. T. & T. Co. and Western Electric Co. will be made.

July 30: Hearing at Madison on handset charges of eight Independent companies which have not complied with commission's general order on handset telephone service to charge eight cents monthly additional or to charge 25 cents monthly additional for a period of two years.

COOK

A Good Plant Deserves Cook Protection. A Poor Plant Needs Cook Protection . . .

S-6 Protected Terminal

No. 7 Lightning Arrester

Substation Protector — Unprotected Terminal

MFG. BY

Cook Electric Co.

CHICAGO

The Manufacturers' Department

Factors Considered in Purchase of Poles

It is now conceded by many that the depth of the depression has been passed and that we are at last headed towards better times, which means that more and better lines of communication will be needed.

All forward-looking telephone companies should have adequate stocks of poles to meet the demand for better communication, purchased in advance of the rise of prices which is already on the way.

In buying poles, C. M. Jordan, president of Jordan Bros. Lumber Co., Norfolk, Va., states, three things should be considered: (1) Original cost; (2) economy in handling and erecting; and (3) long life.

Mr. Jordan, in discussing qualities of poles, cites a company operating in Virginia which has 17 large Virginia white cedar poles in service that were calculated to be at the end of their life about 15 years ago; but, strange as it may seem, they are still standing and giving good service.

• • •

Solderless Service Connectors for Every Purpose

Sturdy solderless service connectors made entirely of tough bronze—hard drawn—by the H. B. Sherman Mfg. Co., of Battle Creek, will no doubt be of interest to many telephone companies. The material used in these connectors is said to have a high copper content and to meet every requirement, with a maximum resistance to corrosion and weather checking.

The threads of the connectors cut away from the end of the bolt, allowing easy starting of the nut. There are no sharp edges with which to cut the hands, gloves or wire. Thread edges are relieved and all sharp corners rounded off. The V-shaped bottom in the wire slot assures a tight contact. The thickness of the nut assures a cross-section proportionate to the strength of the bolt. The bolt, space and nut being fashioned of the same tough bronze material, equal strength of all assembled parts is assured.

The name "Sherman" and the wire size are marked on the head of the nut, together with the designation as to whether the connector has a large or a small head.

Among the other products of the Sherman Mfg. Co. are wedge-grip connectors, brass fixture connectors, bakelite fixture connectors, set screw connectors, fuse clips, splicing sleeves, sheet metal terminals and soldering lugs.

• • •

Communications Executive of Automatic Electric Co.

One of the most interesting developments of business in recent years—a development that has been less conspicuous than it has been far-reaching in its effect—is the extension of the use of automatic telephone switching devices and principles to non-telephone uses.

Industry, on the one hand, has been much attracted by the technical advances which have been made in the science of telephony and has been quick to sense the possibilities offered by the amazing accuracy and speed which is characteristic of the modern automatic telephone exchange.

The Automatic Electric Co., on the other hand, has made exhaustive exploration of the field of utility of its switch-

P. W. CONRAD Recently Added to Executive Staff of the Automatic Electric Co. as Vice-President in Charge of Sales Promotion and Commercial Activities.

ing devices with respect to adaptation to other than purely telephonic uses, as exemplified in electrical remote control operations, race track totalizator, radio broadcast switching, applications to machine operations to effect production economies, etc.

As a result, the Automatic Electric staff has extended its range of operations to include new phases of communication, signaling and control, to meet the requirements imposed by the constantly-increasing mechanization of industrial processes.

This extension of activity, coming at a time when developments in the field of telephony itself were unfolding at a faster rate than ever before, has called for the services of an enlarged executive staff combining thorough knowledge of the telephone field with broad experience in general business.

In conformity with this need, the executive ranks of the Automatic Electric Co. have been expanded to include P. W. Conrad, who has recently been appointed vice-president of the company in charge of all sales promotion and commercial activities.

Mr. Conrad's career in business has been characterized by both variety and unusual interest. Previous to entering the employ of the Automatic company he had traveled extensively in the in-

(*Concluded on page* 34)

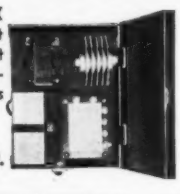
LOOMIS TELEPHONE DIRECTORY ADVERTISING CO.
A SALES ORGANIZATION EXCLUSIVELY
TELEPHONE BLDG. KANSAS CITY, MO.

JOHN M. COOK
TELEPHONE ENGINEER
APPRAISALS RATE STUDIES
Determination of Exchange Costs Incident to the Furnishing of Toll Service.
Five Ivy St. Bldg. ATLANTA, GA.

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization, and Operation of Telephone Companies.
3324 Bankers Bldg., Chicago

ACCOUNTING
HERDRICH AND BOGGS
Certified Public Accountants
Specializing in Telephone Accounting and Rate Cases Since 1918
901-7 Continental Bank Bldg.
Indianapolis, Indiana

NOW—ELECTROX Current Supply Unit for operator's sets at a new low price — $14.85. No batteries needed.
Sent on Trial
Schauer Machine Co.
Cincinnati, Ohio



Buyer's Weekly Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

ADDING MACHINES

Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Bond Electric Corporation, 257 Cornelison Ave., Jersey City, N. J.—Bond Telephone Dry Cells, Bond Flashlights and Batteries, Industrial Flashlights and Batteries, Bond Dry Batteries, Storage Batteries, Voltpruf Special Flashlights for linemen, Victor Telephone Cells and Bond Formula 1216 Inhibitor, ideal for keeping the cooling system of trucks and service cars free from rust, scale and corrosion.

Burgess Battery Co., Freeport, Ill.—Burgess Flashlights and Uni-Cel Flashlight Batteries—for dependability and service. The Burgess Twin-Six Telephone Battery—a 3-volt unit designed to replace two No. 6 cells, with longer life, lighter weight, smaller size and a leakproof case. The Burgess Little-Six—replaces the old type No. 6 cell, is smaller and lighter, will not ooze or bulge, has all the electrical capacity of the standard No. 6 cell.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

Ray-O-Vac Company, Madison, Wis.—Ray-O-Vac telephone batteries — longer life and better service proven by tests in accordance with U. S. Government standards and records of users. Ray-O-Vac flashlights and industrial flashlight batteries are other items showing Ray-O-Vac's outstanding quality.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

BATTERY CHARGING EQUIPMENT

General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

CABLE—LEAD ENCASED

American Electrical Works, Phillipsdale, R. I.—Paper telephone cable, switchboard cable, bare copper wire. Chicago Office: 20 N. Wacker Drive; Cincinnati: Traction Bldg.; New York: 100 E. 42nd St.

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

CABLE RINGS

National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way,—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

CABLE TERMINALS

Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lighting arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—Complete line of cable terminals, telephone and switchboard protectors, sleeves, fuses, solderless wire connectors and specialties.

CARBON DIAPHRAGMS

Noris Carbon Company, Inc., 160 5th Ave., New York, N. Y.—Carbon diaphragms, carbon back plates, granular and globular carbons, lightning arresters.

CONDUIT

Brazil Hollow Brick & Tile Company, Brazil, Ind.—Makers of Brazil Vitrified Tile. Conduit.

CORDS, CABLE AND WIRE

Lenz Electric Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago—Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

ELAPSED TIME RECORDERS

Calculagraph Company, 50 Church St., New York, N. Y.—Calculagraph is the world's standard elapsed time recorder and gives you toll records printed with elapsed time to the second. Both spring driven and electric motor models are available.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

Alfred E. Cowling, Scotstown, Quebec.—Eastern cedar poles, plain or butt treated.

Jordan Bros. Lumber Co., Box 84, Norfolk, Va.—Virginia White Cedar Poles. Plain or charred and creo-treated butts.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

Naugle Pole & Tie Co., 5 South Wabash Ave., Chicago, Ill. Northern White and Western Red Cedar Poles. Plain or butt-treated. Let us quote you our new low prices.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

American Automatic Electric Sales Company, 1033 West Van Buren Street, Chicago, Ill.—Public Automatic Telephone Systems, Private Automatic Telephone Systems, Central Battery and Magneto Manual Telephone Switchboards, Remote Control Switchboards, Telephone Instruments of all types, Battery Eliminators, Charging Equipment, Signaling and Control Apparatus, Cords, Wires, Cables, Monotype Copperweld Drop Wire, and a complete line of construction materials and supplies.

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signalling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England.—Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems. Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems.

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

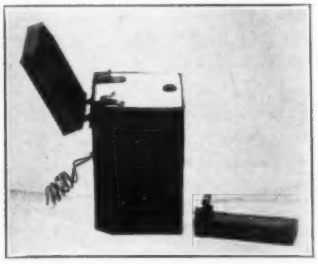
Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Rochester, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

TOOLS

Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

CLASSIFIED SECTION

Rates 10 cents per word payable in advance. Minimum charge $2.00 for 20 words or less.



Locate cable trouble with the **CANTY FAULT FINDER.** This new cable tester operates on two dry cells and locates all cable faults (except opens). There are two binding posts for lead wires to bad cable pairs. Adjustment of tone is simple,—move lock nut up or down. Size 3"x4"x7". No telephone exchange should be without the **CANTY FAULT FINDER.** Price $12.50 postpaid complete, less head set. Address 8101, care of TELEPHONY.

NEED TOLL TICKETS?
Write: Specialty Printers,
Bristol, Tenn.

HARMONIC POLE CHANGERS

Kellogg No. 17A 30-42-54-66
Kellogg No. 6A 16-33-50-66
Kellogg No. 19A Transformer Set
Kellogg No. 21A Transformer Set
Motor Generator Set
Holtzer Cabot MSW-3

BUCKEYE TELEPHONE AND SUPPLY CO.
COLUMBUS, OHIO

FOR SALE

COMPLETE Automatic Electric Company dial telephone system, 25 stations, four simultaneous circuits with motor generator set and large battery. National Zinc Co., Inc., Cherryvale, Kans.

WANTED TO BUY

WANTED TO BUY—Private party wishes to purchase telephone exchange in Indiana, seventy-five to two hundred stations preferred. Down payment, terms necessary. Address 8457, care of TELEPHONY.

USED No. 24 P. A. X. dials. State quantity available and price. Address 8462, care of TELEPHONY.

WANTED

ELECTRICAL ENGINEER with broad telephone background; to collect, tabulate and analyze information in report form; to work on telephone, telegraph, short-wave radio and power line carrier current, telephone and protective relaying problems. Must be free to travel in South. In answering, state whether temporary employment will be considered. Address 8461, care of TELEPHONY.

POSITIONS WANTED

POSITION WANTED — Preparing and supervising employe educational and public relations programs. Maximum success can only be realized through an intelligent understanding of the industrial, political and social economics involved by both owners, employes and consumers. The program visualized is the greatest need of the hour. W. S. Vivian, Ludington, Mich.

EXPERIENCED commercial and traffic man desires position with either Independent telephone company or equipment manufacturer. Am 29 years old and have had plant training in prominent local and toll office of which I was traffic chief. Enjoyed service record. Best references. Address 8463, care of TELEPHONY.

POSITION WANTED—As manager, troubleman and operator. Am 29 years old—have had seven years' experience on both C. B. and Magneto Exchanges. Will go anywhere—wife an experienced operator. Best of references. Address 8458, care of TELEPHONY.

Competent telephone man experienced in all branches, desires position with active company. Will furnish A-1 reference; go anywhere, moderate salary. Address 8434, care TELEPHONY.

(*Concluded from page* 32)

terest of other companies and had shown remarkable ability in sales and sales promotional work. The companies he has served in this capacity include the Linde-Air Products Co., the Aeolian Company, American Export Lines, Halsey Stuart & Co., and others.

It was while in the employ of the American Export Lines that Mr. Conrad traveled widely, being engaged in the promotion of trade relationships with important ports in the Black Sea and the Mediterranean. He has also traveled extensively in southern France and northern Africa.

Mr. Conrad is a graduate of Amherst College and has also completed two years of special graduate study in public utilities and allied fields at the Harvard Graduate School of Business Administration.

He entered the service of the Automatic Electric Co. early in 1934 as assistant vice-president, with offices in New York. In this capacity he assumed direction of special sales negotiations, giving particular attention to the promotion of equipment for railroad and industrial use. Late last year he embarked on a special mission to China in the interest of the company's promotional activities in that area. It was upon his recent return to this country that he was appointed vice-president.

Mr. Conrad thus brings to his new position a combination of experience and ability which is believed to be of timely value, and it is expected that his services will assist materially in promoting the success of the company's program in its expanded field of activity.

• • •

Death of A. G. Bean Pioneer Manufacturer

A. G. Bean, 63, chairman of the board of the White Motor Co., Cleveland, Ohio, died at his home in Elyria, Ohio, on July 19 from a heart attack.

Mr. Bean will be remembered by the older telephone men as identified with the old Dean Electric Co. of Elyria for a number of years, in high executive positions. Upon the reorganization of the Dean company early in 1914 as the Garford Mfg. Co., Mr. Bean became its vice-president and general manager.

When the telephone business of the Garford company was taken over by the Stromberg-Carlson Telephone Mfg. Co., in 1916, Mr. Bean continued with the Garford company in the manufacture of motor trucks. He had continued in the motor truck industry since then.

Mr. Bean was named president of the White Motor Co. in 1930. He retired to the chairmanship of the board last summer when his health became impaired.

In 1932 Mr. Bean was named one of three receivers for the Studebaker corporation.